

North Carolina's
2008
Highway Safety Improvement Report
&
Five Percent Report

August 2008

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PURPOSE

The purpose of the North Carolina Highway Safety Improvement Program (HSIP) is to provide a continuous and systematic procedure that identifies, investigates and addresses specific safety concerns throughout the state. The ultimate goal of the HSIP is to reduce the number of traffic crashes, injuries, and fatalities by reducing the potential for and the severity of these incidents on public roadways.



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August 28, 2008

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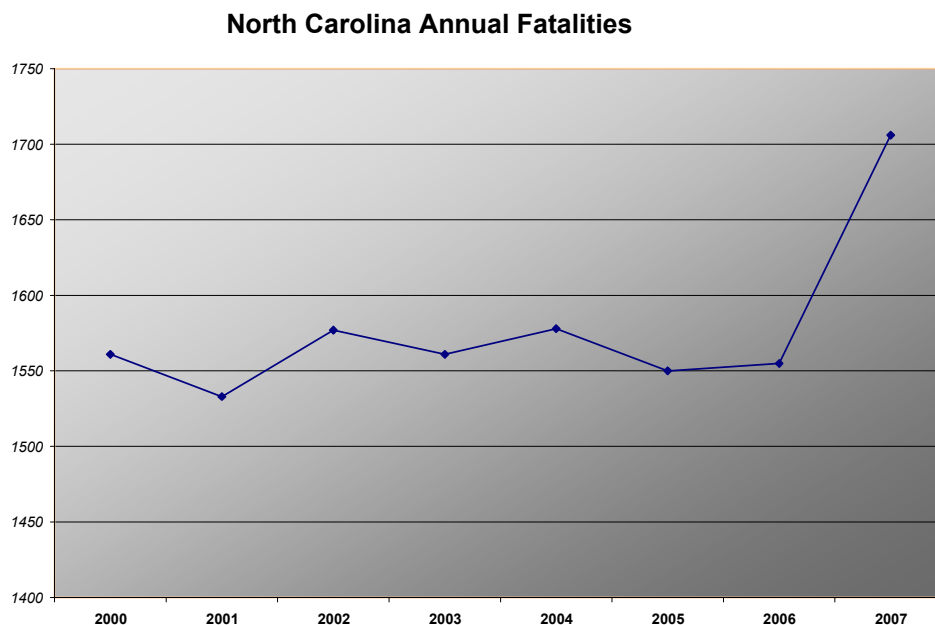
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PREFACE

North Carolina continues to recognize traffic crashes as a significant problem that continues to challenge the state. In 2007, there were 242,174 reported traffic crashes that resulted in 1,706 persons killed and 119,714 injuries on our roadways. The socioeconomic impact of these crashes is severe, resulting in a loss of over \$10 billion to the economy of North Carolina annually. This impact translates to a crash cost to the state of over \$1 million every hour and nearly \$28 million every day and a staggering social impact as well.

North Carolina has established a vision to have a multi-disciplinary, multi-agency highway safety approach to research, planning, investigation, design, construction, maintenance, operation and evaluation of transportation systems, which results in reduced fatalities, injuries and economic losses, related to crashes. In addition, there is a coordinated strategic effort to address emerging safety issues.

In January 2008 the Executive Committee for Highway Safety met to reexamine their goals. The committee agreed to adopt a 2.5% reduction in annual fatalities each year over the next 20 years as the new goals. Reducing the annual fatality counts will be a tremendous challenge. The estimated vehicular travel mileage in North Carolina has approximately doubled since 1985 and this large growth rate is projected to continue over the next two decades.



North Carolina is making progress toward reducing fatalities, and the vision of multi-disciplinary and multi-agency approaches to challenges are becoming well established. However, to make additional gains and sustain previous achievements, our Highway Safety Improvement Program (HSIP) should continue to identify locations with higher than average crash rates and higher than normal severe injury rates. The program should also have the

capability of investigating these locations, developing countermeasures and implementing cost effective solutions rapidly.

The plans, accomplishments, and other information about the Executive Committee for Highway Safety are attached to the following web site. This web site also includes a link to the *North Carolina Strategic Highway Safety Plan*.

<http://www.ncdot.org/doh/preconstruct/traffic/ECHS/>

This “HSIP Report” describes North Carolina DOT’s implementation and effectiveness of its Highway Safety Improvement Program. This submission also includes information required for the “5 Percent Report”. These reports satisfy the requirements under 23 U.S.C. 148(g). The NCDOT Rail Division is developing the “Railway-Highway Crossing Report” as a separate report submission.

North Carolina DOT has opted to use the 2007 Calendar Year as the reporting period for the “HSIP Report” and the “5 Percent Report”; however, some of our 2008 plans, goals, and methods are included in this report.

THE NC HSIP REPORT

A. PROGRESS IN IMPLEMENTING THE HSIP PROJECTS

Network Screening

The Highway Safety Improvement Program Group of the Traffic Safety Unit has developed and continues to refine a systematic procedure that identifies traffic safety concerns throughout the state. A system of safety warrants has been developed to identify locations that are possibly deficient. The system of safety warrants is based on five to ten years of crash data. The criteria for safety warrants include crash frequency, severity, conditions, and percentage of target crashes. Safety warrants have been devised to identify intersections, roadway segments, bridges, and bike/pedestrian intersections. Locations that meet warrants are categorized as potentially hazardous (PH) locations. Our network screening process has the capability of spotting locations on all NC public roadways. The Traffic Safety Unit continually strives to improve the identification of relevant traffic safety issues and the location selection process.

After the locations have been flagged by the safety warrants, the PH locations are ranked by a weighting factor. Typically the weighting factor is a function of crash frequency, severity and percentage of target crashes. The rankings help determine which PH locations will receive priority for the analysis and investigation process.

Detailed information on warranting criteria can be found in the introductory section of the *2007 North Carolina Highway Safety Improvement Program Report*. A copy of the *2007 NC HSIP* was provided to the FHWA regional office in July 2007. Additional copies of this biannual publication are available on request or click the following link to view the document.

<http://www.ncdot.org/doh/preconstruct/traffic/Safety/reports/HSIP/2007hsip.pdf>

NC's HSIP is in a continuous state of review and improvement. After significant changes in the 2005 Cycle, only minor changes were incorporated into the 2007 cycle of the HSIP. These changes are:

- The Last Year Intersection Warrant, I-2, will be ran every six months in order to identify locations that have experienced a tremendous jump in crashes during the most recent twelve month period.
- The Bicycle-Pedestrian Section Warrants were removed for the 2007 HSIP cycle, because these warrants did not consistently identify patterns of crashes that could be treated effectively with typical engineering countermeasures. The Traffic Safety Unit will continue to research alternatives to these warrants that will identify clusters of these crash types.

In 2007 approximately 98 HSIP locations were analyzed by the Highway Safety Improvement Group and sent to the Regional Traffic Engineering Office for investigation. Several other HSIP locations were analyzed by Regional Traffic Engineering and Highway Division staff. These locations are in various states of investigation or project development. Some locations

did not warrant investigation once the analysis was completed. The locations analyzed by the Highway Safety Improvement group are as follows:

- 59 intersection locations
- 27 section locations
- 12 bridge locations

Methodology Used to Rank Locations

The North Carolina HSIP uses several location types:

- intersections
- sections
- bridges
- bicycle intersections
- pedestrian intersections

Each location type listed has a specific set of warrants. When a location is flagged by a warrant, a *weighting factor* is calculated. Each warrant has a unique formula to calculate the *weighting factor*. The *weighting factor* is based on criteria such as crash frequency, severity index and percentage of warranted crashes. Locations with multiple warrants have their weighting factors summed. Then, the *weighting factors* for locations are compared to rank locations. The ranking methodologies for each location type are detailed in the *HIGHWAY SAFETY IMPROVEMENT PROGRAM OPERATIONS MANUAL*. The methodologies have been attached to this report as APPENDICES *A through D*.

PH Location Investigation

The higher ranked PH locations are selected and initiated for detailed crash studies and field investigations. The Traffic Safety Unit (TSU) utilizes the Traffic Engineering Accident Analysis System (TEAAS) to retrieve crash data for the PH location of interest. TEAAS provides several important crash data such as crash rates, severity index, light and road conditions, crash types and crash milepost locations. Collision diagrams are also created to determine which crash patterns are the most prevalent at a location.

After a detailed crash study is completed, a Regional Traffic Engineer investigates the identified PH location. The Regional Traffic Engineers use engineering expertise, regional familiarity, countermeasure knowledge and decision support tools such as Benefit to Cost ratios to develop countermeasures to reduce the frequency and severity of crashes at the identified PH location. Depending on the size and cost of the selected countermeasures, the investigations may result in recommendations that range from requesting our Division maintenance forces to make adjustments or repairs, to developing Spot Safety projects, Hazard Elimination projects, other Transportation Improvement Program (TIP) projects, NC Moving Ahead projects or utilizing other funding sources to initiate projects.

The Regional Traffic Engineering staff investigated approximately 147 HSIP locations during 2007. These locations are in various states of investigation or project development. The locations are as follows:

- 80 intersection locations
- 48 section locations
- 17 bridge locations
- 2 bike/pedestrian locations

The Regional Traffic Engineering Staff investigates other locations because of requests from the Highway Patrol, NCDOT Division offices, citizens, and fatal crash occurrences. After an investigation, Regional Traffic Engineers may request HSIP funds to improve the safety of these locations. These locations are eligible to compete for the safety related funds without being flagged by NC's HSIP warrants.

Project Selection

The NC Safety Oversight Committee has been established to help select the candidate safety projects that will receive funds from the Hazard Elimination Program or the Spot Safety Fund. The committee is composed of NCDOT engineers and representatives from the Highway Patrol, the Governors Highway Safety Program, and the Board of Transportation. The mission of this Committee is to systematically and objectively administer the allocation of limited safety-related funds to those candidate safety projects across the State that provide the most benefit to the traveling public in terms of reducing injuries, fatalities, and motor vehicle crashes.

The Committee meets quarterly to review and make recommendations from the list of proposed projects on the "On Hold" lists. Several tools are used for project selection. One major tool is the *Spot Safety Index (SSI)*. The *SSI* is composed of four parts: *Safety Factor*, *Constructability points*, *Department Goals points* and *Division/Region Priority points*. However, the *Safety Factor* accounts for 60% of the *SSI*. The *Safety Factor* is composed of four equal parts: *Cost per Correctable Crash*, *Severity Index*, *Benefit-to-Cost Ratio*, and *HSIP Listing*. The Safety Oversight Committee submits their list of recommended projects to the Board of Transportation. The projects approved for funding depends on the availability of funds and the policies and guidelines of the Board of Transportation including Division Equity Formula.

Hazard Elimination Program

NC's Hazard Elimination Program funded 33 Transportation Improvement Program projects in 2007. The total amount of funds allocated to these projects was \$13,325,232. An additional \$4,050,000 was used for the safety management program, project identification, analysis and preliminary engineering. Attached as APPENDIX E is a list indicating the location, project description, and allocated amount for each project. In addition, there are 34 unfunded Hazard Elimination projects on hold. The estimated total funds needed for these

projects are \$56,778,050. Attached as APPENDIX F is a list of these projects including a project description and estimated costs.

The estimated project costs of the funded 2007 Hazard Elimination Program Projects ranged from \$4,500 to \$5,570,879. The funds have or will be utilized to: improve vertical alignments, remove sight obstructions, provide channelization, construct directional crossovers, install turn lanes, construct concrete islands, remove/install traffic signals, realign intersections, convert intersections to grade separations, revise signal phasings, widen to dual left turn lanes, install/widen paved shoulders, install cable median guardrail, install milled rumble strips, install snow-plowable raised pavement markers, resurface with friction pavement overlay, widen travel lanes, and install median guardrail.

Spot Safety Program

Project information from the Spot Safety Program is included in this report since many locations that are identified by the HSIP are developed into Spot Safety projects. In 2007, the Spot Safety Program funded 154 new projects totaling \$18,584,200. Also, \$1,003,775 was reverted back into the Spot Safety pool because thirteen previously funded projects were dropped due to: constructability issues, utility conflicts, right-of-way conflicts, recent changes in crash pattern, utilization of other funding sources or inability to secure necessary funds. A total amount of \$371,061 was allocated to previously funded projects to cover increases in construction costs. Furthermore, a net total of \$0 was used to cover changes in project scope for three previously funded projects. The 2007 net expenditure of the Spot Safety Program was \$17,951,486.

An additional 144 Spot Safety projects have been submitted for funding consideration and are on hold. The unfunded projects total an estimated \$17,538,675. Attached is a list of the funded and “on hold” projects, APPENDICES G and H respectively. The list also includes project descriptions and estimated costs.

The estimated project costs of the funded 2007 Spot Safety Fund Projects ranged from \$3000 to \$250,000. The funds will be utilized to: install rumble strips, install / widen paved shoulders, install median barrier, install guardrail, upgrade bridge rail, install / upgrade warning signs and beacons, install friction courses, install / improve pavement markings, widen / improve roadside clear zones, improve curve superelevation, realign curve, install concrete median islands, install right-only intersection restrictions, install directional crossovers, remove median crossover points, install driveway access restrictions, improve intersection sight distance, reduce intersection skew angle, construct / lengthen turn lanes, remove slip ramps, install roundabout, install 4-way stop control, interconnect traffic signals, upgrade / install traffic signals, install flashing yellow arrow heads, revise signal clearance intervals, install signal back plates, install / upgrade crosswalks and install pedestrian countdown heads.

B. ASSESSMENT OF THE HSIP AND HRRP

General Highway Safety Trends

While major strides and enhancements have been made in the areas of highway safety within North Carolina, there is still much room for improvement. Over the past few years North Carolina has averaged over 200,000 crashes, over 100,000 injuries and over 1500 deaths. The actual numbers and trends can be found on [*North Carolina's Strategic Highway Safety Plan*](#). The economic impact of these crashes is severe, resulting in a loss of approximately \$10 billion to the economy of North Carolina annually. Highway safety for the travelling public, our highway workers, emergency responders and law enforcement personnel is a top priority for NCDOT.

Overall HSIP Effectiveness

The North Carolina Highway Safety Improvement Program (HSIP) is an organized and systematic safety process developed to identify, analyze, and investigate potentially hazardous locations with concentrations and patterns of correctable crashes. The program is able to determine locations that exceed minimum warranting criteria that are based on multiple factors that, in most cases, include severity, frequency, and crash type. The program is presently structured into six distinct phases:

- I. Development of warranting criteria
- II. Identification of potentially hazardous locations meeting minimum warrant criteria
- III. Detailed crash analysis of program locations
- IV. Engineering field investigation of program locations and recommendations for improvements (where appropriate)
- V. Project development/implement countermeasures
- VI. Evaluation of countermeasures implemented with HSIP funds

The warrants developed by the Traffic Safety Systems Section (TSSS) have consistently shown the ability to identify intersections, sections, bridges, and bicycle/pedestrian intersections with severe injuries and chronic crash patterns. The Regional Traffic Engineers utilize thorough investigations, traffic operations and safety expertise and proven tools such as signal warrant studies, sight distance measurements, Crash Reduction Factors and Benefit to Cost analysis to ensure to effective projects are developed. For more details on our safety warrants, refer to APPENDICES A through D.

Overall HRRRP Effectiveness

North Carolina's Traffic Safety Systems Section (TSSS) recently initiated a Road Safety Review Program. The purpose of the program is to reduce the rates of severe injury crashes that occur on North Carolina's rural two-lane highways. The program accomplishes this by identifying rural two-lane highways in North Carolina with "severe injury" crash rates above the statewide average, compiling multi-disciplinary road safety review teams, conducting safety reviews for selected roadways, and reporting the conclusions and recommendations of

the teams. For more details on the effectiveness of the Road Safety Review Program, see Section D-3 of this report.

C. EXTENT TO WHICH IMPROVEMENTS CONTRIBUTED TO SPECIFIC GOALS

The Safety Evaluation Group of the Traffic Safety Systems Section is tasked with performing scientific and statistically sound evaluations of safety-related projects to determine the effectiveness of the selected countermeasure(s) at treated locations. The larger goal in this effort is to build crash modification factors based on North Carolina data and projects to aid in future decision making and project development. The methods utilized in the evaluations have continued to be developed and refined. The current methodologies include naïve before and after evaluations, treatment group versus comparison group evaluations, and empirical bayesian techniques.

Since 2004 our Safety Evaluation Group has completed 345 Spot Safety Project evaluations and 33 Hazard Elimination Project Evaluations. Since 2004, the Safety Evaluation Group has initiated another 122 Spot Safety Evaluations and 38 Hazard Elimination Project Evaluations. Please note that most of these projects were funded prior to 2007.

The crash reductions have varied at each project location that has been evaluated. A database is being developed to track the results of the evaluations for the further development of crash reduction factors for safety countermeasures. Completed Spot Safety Project and Hazard Elimination Project evaluations are attached to the following web site:

<http://www.ncdot.org/doh/preconstruct/traffic/Safety/ses/projects/completed.html>

D. HIGH RISK RURAL ROADS PROGRAM

1. Program Implementation

The North Carolina Board of Transportation passed a resolution in 2002 to reduce crashes, fatalities, and injuries on two-lane, two-way roadways because they have proportionally more severe crashes than other roadway classes. A review of the US 601 corridor in southern Union County was developed as a pilot project.

The Traffic Safety Systems Section (TSSS) took the initiative to develop a Road Safety Review Program (RSRP). TSSS has developed a process to identify and prioritize rural two-lane highways with above average fatal or severe injury crash rates. See the APPENDIX I, titled the “Road Safety Review Site Selection Process”, for more details. Once a roadway is selected for a Road Safety Review (RSR), detailed crash data is compiled and a review team is formed. The teams are typically composed of Highway Division engineers, Regional Traffic Engineering staff, TSSS engineers, Federal Highway Administration safety engineers, Highway Patrol staff, and community volunteers. Each individual conducts a safety review of the identified rural road and then submits their observations and recommendations to the RSR Engineer. TSSS is responsible for compiling and reporting the conclusions and recommendations of the review team.

As of July 2008, TSSS has initiated and/or completed fourteen road safety reviews throughout the state. The fourteen project locations are shown on Page 9. Some RSR recommendations have been developed into Division Maintenance/Construction, Hazard Elimination and Spot Safety Program Projects. NCDOT will also use available HRRRP funds to improve safety deficiencies identified by the Road Safety Reviews.

2. Methodology Used to Identify HRRR Locations

The methods used to identify High Risk Rural Roads are outlined on APPENDIX I. The Traffic Safety Systems Section developed this methodology.

3. Assessment of HRRRP Project Effectiveness

Since the Road Safety Review Program began in 2003, NCDOT has not yet constructed a project utilizing HRRRP funds. Currently, NCDOT has reserved HRRRP funds to improve two intersections along SR 1221 in Rowan County. One intersection will be converted from a four-legged intersection to two offset “T-type” intersections. The other intersection will receive intersection sight distance improvements. The estimated costs are \$123,000 and \$149,000, respectively. As recently completed Road Safety Reviews are being studied by division and regional engineering staff, future projects will be developed that will be candidates for the HRRRP.

The Traffic Safety Systems Section will determine the actual effectiveness of HRRRP projects when appropriate. However, we are confident that future HRRRP-funded projects will be effective, because of two major reasons. First, our identification process utilizes crash severity and density data. Second, we utilize Road Safety Review methods that are promoted by the Federal Highway Administration.

Previous efforts in NC utilizing traditional HSIP and Fatal Investigations have yielded good results; however, NCDOT must utilize new approaches to reduce the number of severe crashes that are occurring on our rural highways. The Road Safety Review process will allow NCDOT to better identify deficiencies and develop improved mitigating strategies, while the HRRRP and other programs will provide us with the funds necessary to address identified safety concerns throughout the state.

Road Safety Review Project Locations as of July 2008

COUNTY	ROUTE	STATUS
BURKE	NC 18	Preliminary Planning
BURKE	US 64	Preliminary Planning
COLUMBUS	SR 1429	In Progress
CUMBERLAND	SR 1102	Completed
DUPLIN	NC 11	Completed
GUILFORD	SR 1005	In Progress
HERTFORD	US 13	In Progress
IREDELL	US 21	Completed
JOHNSTON	NC 210	Completed
ONSLOW	SR 1105	Completed
ROWAN	SR 1221	Completed
SCOTLAND	SR 1425	In Progress
UNION	US 601	Completed
WILKES	NC 268	Completed

THE NC FIVE PERCENT REPORT

Introduction

This “5 Percent Report” provides an overview of the intersections, sections, bridges and bicycle/pedestrian intersections identified by our Highway Safety Improvement Program (HSIP). The North Carolina Crash Data System allows us to clearly identify specific locations with severe but correctable crash patterns. The screening process includes all public roads within our state. In May 2007, the higher ranked locations were listed in *the 2007 North Carolina Highway Safety Improvement Program report*, a biannual listing of potentially hazardous (PH) locations. This report is available on the web at www.ncdot.org/doh/preconstruct/traffic/Safety/reports/HSIP/2007hsip.html.

North Carolina’s HSIP and the PH locations mentioned in this “5% Report” are integrated into the [Strategic Highway Safety Plan \(SHSP\)](#). As mentioned in our [SHSP report](#), the [NC Executive Committee for Highway Safety](#) has developed Working Groups to tackle such safety issues as lane departure, incident management, older driver safety and bicycle & pedestrian safety. The Traffic Safety Systems Section has also developed location listings and safety data for older driver crashes, motorcycle crashes, closed loop signal systems, lane departures and other key emphasis area from the AASHTO SHSP in support of our [Strategic Highway Safety Plan](#).

Methodology

The listing of Potentially Hazardous locations covers from 5 to 10 percent of the locations within the state. These locations were flagged for exhibiting the most severe safety needs because these locations showed the strongest pattern of severe and correctable crashes. The criteria used to identify our PH locations were previously outlined in the “[HSIP Report](#)”. Further information on site identification can be found in the introductory section of the [2007 North Carolina Highway Safety Improvement Program Report](#).

Ranking/Prioritization

The ranking methodologies for each location type are detailed in the APPENDICES D through H of the *HIGHWAY SAFETY IMPROVEMENT PROGRAM OPERATIONS MANUAL*. These appendices have been attached to this report.

Locations Identified

The safety warrants from the 2007 Cycle of the HSIP flagged the following number and type of locations:

- 2318 PH intersections
- 520 PH section locations
- 149 PH bridge locations
- 122 PH bicycle and pedestrian intersection locations

The [North Carolina Highway Safety Improvement Program Report](#) lists only the top 400, 200, and 100 potentially hazardous locations in the intersection, section, bicycle and pedestrian intersection categories, respectively. It contains all bridge locations. It also contains all excluded locations by category type with the reasons for not initiating a new investigation for the excluded locations.

With the CD ROM version of the *NC HSIP Report*, the user has the ability to view a listing of all PH locations. The *Report Generator* function of the CD can create special reports with specified filters for viewing. The available reporting criteria include location type, county, city, Traffic Safety Unit region, Highway division, NC highway patrol troop and maximum rank. Corridor reports, which are also available on our previously mentioned webpage, list all PH locations in a specified county grouped by highway route. The report generator requires MS Office Access 2003.

Remedies

The 2007 North Carolina Highway Safety Improvement Program Report listed 3109 locations in May 2007. Due to the lack of resources, crash data verification and an engineering investigation has not been completed for the majority of the PH locations listed. Crash data verification and the engineering investigations are necessary to fully assess conditions and select the best safety countermeasure. Possible remedies for these locations include: add/upgrade/remove traffic signal and/or phasing, construct/improve channelization, widen pavement and/or shoulder, install rumble strips, install/upgrade guardrails and/or barriers, construct traffic calming features, install flashing beacons, install lighting, etc.

Costs

The estimated cost of all the potential remedies can not be fully determined until the countermeasures are selected by engineering investigations. Signage improvement recommendations can cost a few hundred dollars to implement while recommendations to upgrade an at-grade intersection to an interchange can cost several million dollars to complete. Furthermore, some PH locations do not warrant safety improvements or are not constructable but these decisions can not be made until engineering analyses and investigations are completed.

At the end of Calendar Year 2007, 144 locations were listed on the “On Hold List” of the Spot Safety Program. The total estimated cost of the 144 projects was \$17,538,675. This averages to \$121,796 per project. The current maximum allocation for Spot Safety Projects is \$250,000.

At the end of Calendar Year 2007, 34 locations were listed on the “On Hold List” of the Hazard Elimination Program. The total estimated cost of the 34 projects was \$56,778,050. This averages to \$1,669,942 per project. However, the traditional cap for this program is \$1,000,000.

The 2007 HSIP Cycle flagged 3109 locations in May 2007. During calendar year 2007, the Spot Safety Program (SSP) and the Hazard Elimination Program (HEP) funded 187 projects in total. There are 178 projects remaining on the two “On Hold Lists” totaling an estimated \$74.3 million. It should be noted that not all of the funded and/or programmed locations originated from the 2007 HSIP. It should also be noted that an undetermined number of PH locations were improved with operation/maintenance funds, discretionary funds and other funding sources. However, this leaves 2744 PH assumed locations, flagged by the 2007 HSIP cycle, that have not been programmed for safety funds.

For the purposes of this report only, rough estimates for potential remedies can be calculated using the average cost of projects on the “On Hold Lists”, assuming that the remaining 2744 PH locations warrant safety improvements. If we use the current ratio of Spot Safety projects to Hazard Elimination Projects, then we can assume that the remaining PH locations will create 484 HEP projects and 2260 SSP projects. Utilizing the current project averages, the roughly estimated cost of the safety remedies would be approximately \$275 million for Spot Safety projects and approximately \$809 million for Hazard Elimination projects. These calculations assume that the number of 2007 Cycle PH locations funded by non-HSIP sources is equal to the number of Spot Safety and Hazard Elimination Program locations not listed by the 2007 HSIP cycle. When the amounts above are added to the cost of projects on the “On Hold Lists”, the total amount of the potential remedies would be over *\$1.1 billion*. It should be noted that this estimate for potential remedies is not based on a detailed engineering study. Therefore, these estimates should not be used for planning or programming purposes.

Other Impediments to Remedies

The impediments to implementation of the remedies other than costs can not be determined until they are discovered during an engineering investigation. The list of possible impediments includes environmental permits, right of way acquisition, resident/property owner opposition, local government opposition, and utility conflicts. Other possible impediments include competent engineering and technical manpower necessary for investigation, design, construction and evaluation of safety projects.

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APPENDIX A

INTERSECTION WARRANTS

The following intersection warrants were initially developed for the 1996 safety program (except for Warrants I-4 and I-5 that were initially developed in 1998), but were revised for the 1997, 1998 (fall) and 2005 safety programs to their current criteria. Intersection Warrants I-1 through I-4 are based on non-PVA crashes occurring within 150 feet of an intersection during the previous five (5) years (or as much data as is available for the previous five years). Warrant I-5 is based on non-PVA crashes occurring within 150 feet of an intersection during the previous ten years (or as much data as is available for the previous ten years), addresses specific chronic crash patterns, and is only analyzed if an intersection does not meet warrants I-1 through I-4. Due to a restructuring of the entire HSIP process, methods, and program, the 1998 (fall) warrants were carried over into the 2000 (spring) safety program. Reviewing of the warrants indicated that no changes were necessary for the 2001 HSIP. Significant changes were made to the 2005 HSIP, mainly caused by the programs I-1 through I-4 warrants being based upon 5 years of data and not 3 years. A weighting factor is used to compare and rank intersection locations that have been determined by these warrants to be potentially hazardous locations.

Warrant I-1: Frontal Impact Crashes

In order for an intersection location to be determined as potentially hazardous for frontal impact crashes, the location must meet all of the following criteria:

- At least 25 crashes occurred during the previous 5 years (or available data).
- At least 50% of all crashes were frontal impact crashes:
 - Angle
 - Left Turn (same or different roadways)
 - Right Turn (same or different roadways)
 - Head On
- At least 25% of all crashes occurred during the previous 2 years (or available data).
- All crashes evaluated are non-PVA crashes.

The weighting method for Warrant I-1 is based on the frequency and severity of crashes (overall crashes and frontal impact crashes) at the location during the last 5 years for those locations determined to be potentially hazardous for frontal impact crashes. The weighting factor for this warrant is calculated using the following formula:

$$F_{I1} = (N_i / N_c) * (P_i / P_c) * (SI_{I1} / SI_{avgI1})$$

Where:

F_{I1}	=	Weighting factor for Warrant I-1
N_i	=	Number of all crashes that occurred at the given location in the previous 5 years
N_c	=	Critical number of crashes occurring at Warrant I-1 locations in the previous 5 years (as defined by the current warrant criteria)
P_i	=	Percent of frontal impact crashes at the given location
P_c	=	Critical percent of frontal impact crashes at Warrant I-1 locations (as defined by the current warrant criteria)
SI_{I1}	=	Severity index of frontal impact crashes at the given location in the previous 5 years (See Table A-1)
SI_{avgI1}	=	Average severity index of frontal impact crashes at all locations meeting Warrant I-1 during the previous 5 years (See Table A-1)

NOTE:

If the location does not meet the criteria for any part of Warrant I-1, then the weighting factor of the location for this warrant is set equal to zero ($F_{I1} = 0$).

The severity index is calculated by converting each crash to a “property damage only” (PDO) equivalency. The severity of a crash is determined by the most severe injury involved in the incident regardless of the number of injuries (for example, if a crash has one A type injury and six C type injuries, then it is classified as an A type crash). The equivalent property damage only (EPDO) index is calculated using calibrated coefficients based on crash cost data and was last calibrated in 1995. The severity index (SI) is essentially the EPDO for the average crash and is calculated by dividing the EPDO Index by the number of crashes.

Table A-1. North Carolina Crash Severity Scale

Crash Severity	EPDO Constant	Description
K	76.8	One or more people are killed at the scene or die within 30 days of the crash due to injuries received from the crash.
A	76.8	One or more people receive incapacitating injuries that prevent the individuals from performing their normal activities for 24 hours or longer.
B	8.4	One or more people receive non-incapacitating injuries that are apparent at the scene and will not prevent the individual from performing their normal activities for more than 24 hours.
C	8.4	One or more people complain of pain or momentary unconsciousness; however, the injuries are not visible or obvious at the scene of the crash.
O	1	No one is injured and only property is damaged.

Warrant I-2: Last Year Crashes

In order for an intersection location to be determined as potentially hazardous for an increased rate of crashes, the location must meet all of the following criteria:

- At least 25 crashes occurred during the previous 5 years (or available data).
- At least 38% of all crashes occurred during the previous 12 months (or available data).
- All crashes evaluated are non-PVA crashes.

The weighting method for Warrant I-2 is based on the frequency and severity of crashes (overall crashes and previous year crashes) at the location during the previous 5 years for those locations determined to be potentially hazardous for an increased crash rate. The weighting factor for this warrant is calculated using the following formula:

$$F_{I2} = (N_i / N_c) * (P_i / P_c) * (SI_{I2} / SI_{avgI2})$$

Where:

F_{I2}	=	Weighting factor for Warrant I-2
N_i	=	Number of all crashes that occurred at the given location in the previous 5 years
N_c	=	Critical number of crashes occurring at Warrant I-2 locations in the previous 5 years (as defined by the current warrant criteria)
P_i	=	Percent of “previous year” crashes at the given location during the previous 12 months
P_c	=	Critical percent of “previous year” crashes at Warrant I-2 locations in the previous 12 months (as defined by the current warrant criteria)
SI_{I2}	=	Severity index of “previous year” crashes that occurred at the given location in the previous 12 months (See Table A-1)
SI_{avgI2}	=	Average severity index of “previous year” crashes for all locations meeting Warrant I-2 (See Table A-1)

NOTE:

If the location does not meet the criteria for any part of Warrant I-2, then the weighting factor of the location for this warrant is set equal to zero ($F_{I2} = 0$).

Warrant I-3: Frequency with a Minimum Severity Index

In order for an intersection location to be determined as potentially hazardous for severe crashes, the location must meet all of the following criteria:

- At least 25 crashes occurred during the previous 5 years (or available data).
- At least 25% of all crashes occurred during the previous 2 years (or available data).
- The severity index is at least 7.0 for the given location.
- All crashes evaluated are non-PVA crashes.

The weighting method for Warrant I-3 is based on frequency and severity of crashes (overall crashes and previous year crashes) at the location during the previous 5 years for those locations determined to be potentially hazardous for severe crashes. The weighting factor for this warrant is calculated using the following formula:

$$F_{I3} = (N_i / N_c) * (P_i / P_c) * (SI_{I3} / SI_{avgI3})$$

Where:

F_{I3}	=	Weighting factor for Warrant I-3
N_i	=	Number of all crashes that occurred at the given location in the previous 5 years
N_c	=	Critical number of crashes occurring at Warrant I-3 locations in the previous 5 years (as defined by the current warrant criteria)
P_i	=	Percent of “previous year” crashes at the given location during the previous 12 months
P_c	=	Critical percent of “previous year” crashes at Warrant I-3 locations in the previous 12 months (as defined by the current warrant criteria)
SI_{I3}	=	Severity index of crashes that occurred at the given location in the previous 60 months (See Table A-1)
SI_{avgI3}	=	Defined minimum severity threshold of 7.0 (See Table A-1)

NOTE:

If the location does not meet the criteria for any part of Warrant I-3, then the weighting factor of the location for this warrant is set equal to zero ($F_{I3} = 0$).

Warrant I-4: Night Crashes without Streetlights

The overall evaluation of Warrant I-4 is based on sub-Warrant I-4a and sub-Warrant I-4b.

If the given location meets the criteria for sub-Warrant I-4a, but not sub-Warrant I-4b, then the weighting factor of the location for Warrant I-4 is set equal to the weighting factor for sub-Warrant I-4a ($F_{I4} = F_{I4a}$).

If the given location meets the criteria for sub-Warrant I-4b, but not sub-Warrant I-4a, then the weighting factor of the location for Warrant I-4 is set equal to the weighting factor for sub-Warrant I-4b ($F_{I4} = F_{I4b}$).

If the given location meets the criteria for both sub-warrants, then the weighting factor of the location for Warrant I-4 is set equal to the greater of the weighting factors of the sub-warrants:

If $F_{I4a} \geq F_{I4b}$ then $F_{I4} = F_{I4a}$

If $F_{I4b} > F_{I4a}$ then $F_{I4} = F_{I4b}$

If $F_{I4a} = F_{I4b} = 0$ then $F_{I4} = 0$

If the given location does not meet the criteria for either sub-warrant (I-4a or I-4b) then the weighting factor of the location for Warrant I-4 is set equal to zero ($F_{I4} = 0$).

Sub-Warrant I-4a: Urban Night Crashes without Streetlights

In order for an intersection location to be determined as potentially hazardous for crashes occurring in urban locations at night without streetlights, the location must meet all of the following criteria:

- At least 15 crashes occurred in an urbanized area at night without streetlights during the previous 5 years (or available data).
- At least 12.5% of all crashes at the given location during the previous 5 years (or available data) occurred in an urbanized area at night without streetlights.
- At least 25% of all crashes at the given location occurred during the previous 2 years (or available data).
- All crashes evaluated are non-PVA crashes.

The weighting method for Warrant I-4a is based on the frequency and severity of crashes (overall crashes and urban night crashes without streetlights) at the location during the previous 60 months for those locations determined to be potentially hazardous for urban night crashes without streetlights. The weighting factor for this warrant is calculated using the following formula:

$$F_{I4a} = (N_i / N_c) * (P_i / P_c) * (SI_{I4a} / SI_{avgI4a})$$

Where:

F_{I4a}	=	Weighting factor for Warrant I-4a
N_i	=	Number of all crashes that occurred at the given location in the previous 5 years
N_c	=	Critical number of crashes occurring at Warrant I-4a locations in the previous 5 years (as defined by the current warrant criteria)
P_i	=	Percent of urban night crashes without streetlights at the given location during the previous 5 years
P_c	=	Critical percent of urban night crashes without streetlights at Warrant I-4a locations in the previous 5 years (as defined by the current warrant criteria)
SI_{I4a}	=	Severity index of urban night crashes without streetlights that occurred at the given location in the previous 5 years (See Table A-1)
SI_{avgI4a}	=	Average severity index of all urban night crashes without streetlights for all locations meeting Warrant I-4a (See Table A-1)

NOTE:

If the location does not meet the criteria for any part of Warrant I-4a, then the weighting factor of the location for this warrant is set equal to zero ($F_{I4a} = 0$).

Sub-Warrant I-4b: Rural Night Crashes without Streetlights

In order for an intersection location to be determined as potentially hazardous for crashes occurring in rural locations at night without streetlights, the location must meet all of the following criteria:

- At least 12 crashes occurred in a rural area at night without streetlights during the previous 5 years (or available data).
- At least 25% of all crashes at the given location during the previous 5 years (or available data) occurred in a rural area at night without streetlights.
- At least 20% of all crashes at the given location occurred during the previous 12 months (or available data).
- At least 25% of all crashes at the given location occurred during the previous 2 years (or available data).
- All crashes evaluated are non-PVA crashes.

The weighting method for Warrant I-4b is based on the frequency and severity of crashes (overall crashes and rural night crashes without streetlights) at the location during the previous 60 months for those locations determined to be potentially hazardous for rural night crashes without streetlights. The weighting factor for this warrant is calculated using the following formula:

$$F_{I4b} = (N_i / N_c) * (P_i / P_c) * (SI_{I4b} / SI_{avgI4b})$$

Where:

F_{I4b}	=	Weighting factor for Warrant I-4b
N_i	=	Number of all crashes that occurred at the given location in the previous 5 years
N_c	=	Critical number of crashes occurring at Warrant I-4b locations in the previous 5 years (as defined by the current warrant criteria)
P_i	=	Percent of rural night crashes without streetlights at the given location during the previous 5 years
P_c	=	Critical percent of rural night crashes without streetlights at Warrant I-4b locations in the previous 5 years (as defined by the current warrant criteria)
SI_{I4b}	=	Severity index of rural night crashes without streetlights that occurred at the given location in the previous 5 years (See Table A-1)
SI_{avgI4b}	=	Average severity index of all rural night crashes without streetlights for all locations meeting Warrant I-4b (See Table A-1)

NOTE:

If the location does not meet the criteria for any part of Warrant I-4b, then the weighting factor of the location for this warrant is set equal to zero ($F_{I4b} = 0$).

Warrant I-5: Chronic Intersection Locations

Warrant I-5 addresses specific crash types and is only analyzed if an intersection does not meet warrants I-1 through I-4. In order for an intersection location to be determined as potentially hazardous for a chronic crash pattern, the location must meet both of the following criteria:

- An minimum of 20 crashes occurred at the given location for reported crashes occurring during the previous 10 years.
- All crashes evaluated are non-PVA crashes.
- At least 15% of all crashes at the given location occurred during the previous 3 years.
- At least 80% of all crashes were one of the following crash types:
 1. Rear End
 2. Crossing Pattern (including Left Turn crashes, Angle crashes, and Head On crashes)

The weighting method for Warrant I-5 is based on the frequency and severity of crashes (overall crashes and chronic pattern crashes) at the location for the previous ten years for those locations determined to be potentially hazardous for chronic pattern crashes. The weighting factor for this warrant is calculated using the following formula:

$$F_{I5} = (N_i / Y) * (P_i / P_c) * (SI_{I5} / SI_{avgI5})$$

Where:

F_{I5}	=	Weighting factor for Warrant I-5
N_i	=	Number of all crashes that occurred at the given location (for all available data)
Y	=	Number of years of data being used for the location
P_i	=	Percent of chronic pattern crashes (for a particular crash type) at the given location for all available data
P_c	=	Critical percent of chronic pattern crashes (for a particular crash type) for Warrant I-5 locations for all available data (as defined by the current warrant criteria)
SI_{I5}	=	Severity index of chronic pattern crashes (for a particular crash type) that occurred at the given location for all available data (See Table A-1)
SI_{avgI5}	=	Average severity index of all chronic pattern crashes (for a particular crash type) for all locations meeting Warrant I-5 (See Table A-1)

NOTE:

If the location meets any of Warrants I-1 through I-4, then the weighting factor of the location for this warrant is set equal to zero ($F_{I5} = 0$).

If the location does not meet any of the criteria for Warrants I-1 through I-4, and the location does not meet the criteria for this warrant, then the weighting factor of the location for this warrant is set equal to zero ($F_{I5} = 0$).

Overall Weighting Factor for Intersection Warrants

The weighting method for potentially hazardous intersection locations is based on the individual weighting factors for each warrant. The overall weighting factor used to compare and prioritize intersection locations that have been determined to be potentially hazardous is calculated using the following criteria or formula:

If the location meets any of intersection warrants I-1 through I-4, then the overall weighting factor for the location is:

$$F_{INT} = F_{I1} + F_{I2} + F_{I3} + F_{I4}$$

Where:

F_{INT}	=	Overall weighting factor for intersection warrants
F_{I1}	=	Weighting factor for Warrant I-1
F_{I2}	=	Weighting factor for Warrant I-2
F_{I3}	=	Weighting factor for Warrant I-3
F_{I4}	=	Weighting factor for Warrant I-4

If the location does not meet any of intersection warrants I-1 through I-4, but meets Warrant I-5, then the overall weighting factor for the location is equal to the weighting factor for Warrant I-5 ($F_{INT} = F_{I5}$).

If the location does not meet any of the intersection warrants then the overall weighting factor for the location is zero ($F_{INT} = 0$).

APPENDIX B

SECTION WARRANTS

Section warrants S-1 and S-2 were initially developed for the 1996 safety program, but were revised to their current criteria for the 1997, 1998 (fall) and 2005 safety programs. Section warrant S-3 was developed for the 1997 safety program, and warrant S-4 was developed for the 1998 (spring) safety program. Due to a restructuring of the entire HSIP process, methods, and program, the 1998 (fall) warrants were carried over into the 2000 (spring) safety program. Reviewing of the warrants indicated that no changes were necessary for the 2001 safety program. The 2005 safety program incorporated a complete restructuring of the section identification process, which now uses a sliding scale process. A weighting factor is used to compare and rank section locations that have been determined by these warrants to be potentially hazardous locations.

For each valid warrant location, it is required that for the analysis period of 5 years, a minimum number of crashes and crashes/per mile rates are met. These minimum required values were defined by facility type as follows:

Facility Type	Minimum Total Crashes	Minimum Crashes/ Mile Rate
Interstate	30	60
US Route	20	40
NC Route	20	40
SR Route	15	30
City Street	20	40

For the purposes of warrants S-1 and S-2, a run off road (ROR) type crash is considered to be one of the following crash types:

- Run Off Road (right, left or straight)
- Fixed Object
- Overturn/Rollover

In addition, the following crash types are reviewed and may be considered as run off road crashes for the purpose of these warrants

- Sideswipe Opposite Direction
- Parked Motor Vehicle
- Head On

Warrant S-1: Run Off Road during Wet Road Condition Crashes

In order for a roadway section (strip) location to be determined as potentially hazardous for run off road crashes (during wet road conditions), the location must meet the following criteria:

- The minimum total crash and crash rate for the respective facility type is met
- At least 35% of all crashes during the previous 5 years were run off road during wet road condition crashes.
- All crashes evaluated are non-PVA crashes.

The weighting method for Warrant S-1 is based on the frequency, total crashes per mile rate and severity of run off road during wet road condition crashes at the location during the previous 5 years. The weighting factor for this warrant is calculated using the following formula:

$$F_{S1} = (N_i / N_c) * (R_i / R_c) * (P_i / P_c) * (SI_{S1} / SI_{avgS1})$$

Where:

F_{S1}	=	Weighting factor for Warrant S-1
N_i	=	Number of all crashes that occurred at the given location in the previous 5 years
N_c	=	Critical number of crashes occurring at Warrant S-1 locations in the previous 5 years (as defined by the current warrant criteria)
R_i	=	Total crashes per mile rate that occurred at the given location in the previous 5 years
R_c	=	Critical total crashes per mile rate occurring at Warrant S-1 locations in the previous 5 years (as defined by the current warrant criteria)
P_i	=	Percent of run off road during wet road condition crashes at the given location during the previous 5 years
P_c	=	Critical percent of run off road during wet road condition crashes at Warrant S-1 locations in the previous 5 years (as defined by the current warrant criteria)
SI_{S1}	=	Severity index of run off road during wet road condition crashes that occurred at the given location in the previous 5 years (See Table A-1)
SI_{avgS1}	=	Average severity index for all locations meeting Warrant S-1 for run off road during wet road condition crashes (See Table A-1)

NOTE:

If the location does not meet the criteria for any part of Warrant S-1, then the weighting factor of the location for this warrant is set equal to zero ($F_{S1} = 0$).

Warrant S-2: Run Off Road Crashes

In order for a roadway section (strip) location to be determined as potentially hazardous for run off road crashes, the location must meet the following criteria:

- The minimum total crash and crash rate for the respective facility type is met.
- At least 60% of all crashes during the previous 5 years were run off road crashes.
- All crashes evaluated are non-PVA crashes.

The weighting method for Warrant S-2 is based on the frequency, total crashes per mile rate and severity of run off road crashes at the location during the previous 5 years. The weighting factor for this warrant is calculated using the following formula:

$$F_{S2} = (N_i / N_c) * (R_i / R_c) * (P_i / P_c) * (SI_{S2} / SI_{avgS2})$$

Where:

F_{S2}	=	Weighting factor for Warrant S-2
N_i	=	Number of all crashes that occurred at the given location in the previous 5 years
N_c	=	Critical number of crashes occurring at Warrant S-2 locations in the previous 5 years (as defined by the current warrant criteria)
R_i	=	Total crashes per mile rate that occurred at the given location in the previous 5 years
R_c	=	Critical total crashes per mile rate occurring at Warrant S-2 locations in the previous 5 years (as defined by the current warrant criteria)
P_i	=	Percent of run off road crashes at the given location during the previous 5 years
P_c	=	Critical percent of run off road crashes at Warrant S-2 locations in the previous 5 years (as defined by the current warrant criteria)
SI_{S2}	=	Severity index of run off road crashes that occurred at the given location in the previous 5 years (See Table A-1)
SI_{avgS2}	=	Average severity index of run off road crashes for all locations meeting Warrant S-2 (See Table A-1)

NOTE:

If the location does not meet the criteria for any part of Warrant S-2, then the weighting factor of the location for this warrant is set equal to zero ($F_{S2} = 0$).

Warrant S-3: Wet Road Condition Crashes

In order for a roadway section (strip) location to be determined as potentially hazardous for wet road condition crashes, the location must meet the following criteria:

- The minimum total crash and crash rate for the respective facility type is met.
- At least 50% of all crashes during the previous 5 years (or available data) were wet road condition crashes.
- All crashes evaluated are non-PVA crashes.

The weighting method for Warrant S-3 is based on the frequency, total crashes per mile rate and severity of run off road crashes at the location during the previous 5 years. The weighting factor for this warrant is calculated using the following formula:

$$F_{S3} = (N_i / N_c) * (R_i / R_c) * (P_i / P_c) * (SI_{S3} / SI_{avgS3})$$

Where:

F_{S3}	=	Weighting factor for Warrant S-3
N_i	=	Number of all crashes that occurred at the given location in the previous 5 years
N_c	=	Critical number of crashes occurring at Warrant S-3 locations in the previous 5 years (as defined by the current warrant criteria)
R_i	=	Total crashes per mile rate that occurred at the given location in the previous 5 years
R_c	=	Critical total crashes per mile rate occurring at Warrant S-3 locations in the previous 5 years (as defined by the current warrant criteria)
P_i	=	Percent of wet road condition crashes at the given location during the previous 5 years
P_c	=	Critical percent of wet road condition crashes at Warrant S-3 locations in the previous 5 years (as defined by the current warrant criteria)
SI_{S3}	=	Severity index of wet road condition crashes that occurred at the given location in the previous 5 years (See Table A-1)
SI_{avgS3}	=	Average severity index of wet road condition crashes for all locations meeting Warrant S-3 (See Table A-1)

NOTE:

If the location does not meet the criteria for any part of Warrant S-3, then the weighting factor of the location for this warrant is set equal to zero ($F_{S3} = 0$).

Warrant S-4: Non-Intersection Night Crashes without Streetlights

In order for a roadway section (strip) location to be determined as potentially hazardous due to non-intersection night crashes without streetlights, the location must meet the following criteria:

- The minimum total crash and crash rate for the respective facility type is met.
- At least 50% of all crashes during the previous 5 years (or available data) were non-intersection night crashes without streetlights.
- All targeted night crashes without streetlights must be at least 150 feet (0.0284 miles) from a roadway intersection.
- All crashes evaluated are non-PVA crashes.

The weighting method for Warrant S-4 is based on the frequency, total crashes per mile rate and severity of non-intersection night crashes without streetlights during the previous 5 years. The weighting factor for this warrant is calculated using the following formula:

$$F_{S4} = (N_i / N_c) * (R_i / R_c) * (P_i / P_c) * (SI_{S4} / SI_{avgS4})$$

Where:

F_{S4}	=	Weighting factor for Warrant S-4
N_i	=	Number of all crashes that occurred at the given location in the previous 5 years
N_c	=	Critical number of crashes occurring at Warrant S-4 locations in the previous 5 years (as defined by the current warrant criteria)
R_i	=	Total crashes per mile rate that occurred at the given location in the previous 5 years
R_c	=	Critical total crashes per mile rate occurring at Warrant S-4 locations in the previous 5 years (as defined by the current warrant criteria)
SI_{S4}	=	Severity index of non-intersection night crashes without streetlights that occurred at the given location in the previous 60 months (See Table A-1)
SI_{avgS4}	=	Average severity index of non-intersection night crashes without streetlights for all locations meeting Warrant S-4 (See Table A-1)

NOTE:

If the location does not meet the criteria for any part of Warrant S-4, then the weighting factor of the location for this warrant is set equal to zero ($F_{S4} = 0$).

Overall Weighting Factor for Section Warrants

The weighting method for potentially hazardous section locations is based on the individual weighting factors for each warrant. The overall weighting factor used to compare and prioritize section locations that have been determined to be potentially hazardous is calculated using the following criteria or formula:

If the location meets any of section warrants S-1 through S-4, then the overall weighting factor for the location is:

$$F_{SEC} = F_{S1} + F_{S2} + F_{S3} + F_{S4}$$

Where:

F_{SEC}	=	Overall weighting factor for section warrants
F_{S1}	=	Weighting factor for Warrant S-1
F_{S2}	=	Weighting factor for Warrant S-2
F_{S3}	=	Weighting factor for Warrant S-3
F_{S4}	=	Weighting factor for Warrant S-4

If the location does not meet any individual warrants and their weighting factor is equal to zero, do not include them in the above formula.

If the location does not meet any of the section warrants then the overall weighting factor for the location is zero ($F_{SEC} = 0$).

APPENDIX C BRIDGE WARRANT

Bridge warrants were initially developed for the 1998 (fall) safety program. Due to a restructuring of the entire HSIP process, methods, and program, the 1998 (fall) warrant was carried over into the 2000 (spring) safety program. No changes were deemed to be necessary for the 2001 safety program. The 2005 HSIP began to utilize a method of matching crashes to specific mileposted bridges. This warrant does not cover underpass locations.

Warrant B-1: Bridge and Bridge Approach Crashes

In order for a bridge location to be determined as potentially hazardous, the location must meet all of the following criteria (based on all possible data):

- The location must average a minimum of one crash per year.
- At least 30% of all crashes must have occurred in the previous 3 years.
- All crashes evaluated are non-PVA crashes.
- The total number of crashes of a particular category ($N1_i$, $N2_i$, or $N3_i$) must exceed at least one of the same parameters for the given facility type (see Table G.1).

Where:

- $N1_i$ = The total number of crashes with vehicles striking the bridge rail.
- $N2_i$ = The number of crashes that occurred on the structure and were any of the following types: run off road, hit fixed or other object, sideswipe, or head on.
- $N3_i$ = The number of crashes that were recorded on the same road with the same reference road(s) as $N1_i$ or $N2_i$ crashes and were any of the following types: run off road, hit fixed or other object, overturn/rollover, sideswipe, or head on.

**TABLE C.1
Minimum Crashes per Bridge Parameter by Facility Type (2005 HSIP)**

FACILITY TYPE	$N1_c$	$N2_c$	$N3_c$
INTERSTATE	<u>10</u>	<u>21</u>	<u>255</u>
US 2 LANE (INCLUDES US 3 LANE)	<u>5</u>	<u>9</u>	<u>116</u>
US 4+ LANE, UNDIVIDED	<u>9</u>	<u>15</u>	<u>176</u>
US 4+ LANE, DIVIDED	<u>8</u>	<u>15</u>	<u>214</u>
NC 2 LANE (INCLUDES NC 3 LANE)	<u>5</u>	<u>7</u>	<u>93</u>
NC 4+ LANE	<u>5</u>	<u>10</u>	<u>168</u>
SR 2 LANE (INCLUDES SR 3 LANE)	<u>4</u>	<u>6</u>	<u>36</u>
SR 4+ LANE	<u>4</u>	<u>10</u>	<u>133</u>
ALL US ROUTES	<u>5</u>	<u>9</u>	<u>116</u>
ALL NC ROUTES	<u>5</u>	<u>8</u>	<u>124</u>
ALL SR ROUTES	<u>4</u>	<u>6</u>	<u>52</u>
CITY STREET	<u>5</u>	<u>6</u>	<u>82</u>

The weighting method for this warrant is based on how much the location exceeded the parameters in the warrant criteria and the severity of the crashes in the previous three years. The weighting factor will be used to compare and prioritize bridge locations that have been determined by Warrant B-1 to be potentially hazardous locations and are calculated using the following formula:

$$F_{B1} = (N1_i / N1_c) * (N2_i / N2_c) * (N3_i / N3_c) * (P_i / P_c) * (SI_{B1} / SI_{avgB1})$$

Where:

F_{B1}	=	Weighting factor for Warrant B-1
$N1_i$	=	Number of crashes at the given location with vehicles striking the bridge rail
$N2_i$	=	Number of crashes at the given location that occurred on the structure and were run off road, hit fixed or other object, overturn/rollover sideswipe or head on crashes
$N3_i$	=	Number of crashes at the given location that were recorded on the same road with the same reference road as crashes that were $N1_i$ or $N2_i$ and were run off road, hit fixed or other object, overturn/rollover sideswipe or head on crashes
$N1_c$	=	95 th percentile of $N1_i$ crashes (for the facility type) for all locations of the same facility type meeting Warrant B-1
$N2_c$	=	95 th percentile of $N2_i$ crashes (for the facility type) for all locations of the same facility type meeting Warrant B-1
$N3_c$	=	99 th percentile of $N3_i$ crashes (for the facility type) for all locations of the same facility type meeting Warrant B-1
P_i	=	Percent of crashes at the given location occurring in the previous 3 years
P_c	=	Critical percent of crashes at bridge locations in the previous 3 years (as defined by the current warrant criteria)
SI_{B1}	=	Severity index of crashes at the location in the previous 36 months
SI_{avgB1}	=	Average severity index of crashes at all locations meeting Warrant B-1 in the previous 3 years

NOTES:

If any part ($N1_i$, $N2_i$, or $N3_i$) of the warrant does not exceed the parameter for the given facility type, then those specific ratios are set equal to 1 and are not equal to 0. This is to ensure that the overall location weight is not set to zero if some facility parameters are exceeded but one is not.

If the location does not meet the criteria for any part ($N1_i$, $N2_i$, or $N3_i$) of the warrant, then the overall weight of the location is set equal to zero ($F_{B1} = 0$).

APPENDIX D

BICYCLE AND PEDESTRIAN INTERSECTION WARRANTS

Bicycle and Pedestrian Intersection warrants P-1 through P-4 and X-1 through X-4 were initially developed for the 2001 safety program. All safety warrants are based on 10 years of crash data (unless specifically noted otherwise). No adjustments to the criteria have been made since its inception. A weighting factor is used to compare and rank section locations that have been determined by these warrants to be potentially hazardous locations.

Warrant P-1: Last 3 Years (Pedestrians)

In order for a pedestrian intersection location to be determined as potentially hazardous for an increased rate over the past 3 years, the location must meet all of the following criteria:

- At least 4 crashes involving pedestrians reported in the last 10 years of available data
- At least 45% of all crashes involving pedestrians must have occurred in the last 36 months

The weighting method for Warrant P-1 is based on the frequency and severity of crashes at the location during the previous 3 years compared to all other locations determined to be potentially hazardous for an increased crash rate. The weighting factor for this warrant is calculated using the following formula:

$$F_{P1} = (N_i / N_c) * (P_i / P_c) * (SI_{P1} / SI_{avg P1})$$

Where:

F_{P1}	=	Weighting factor for Warrant P-1
N_i	=	Number of all pedestrian crashes that occurred at the given location in the previous 10 years
N_c	=	Critical number of crashes occurring at Warrant P-1 locations in the previous 10 years (as defined by the current warrant criteria)
P_i	=	Percent of pedestrian crashes occurring at the given location during the previous 3 years
P_c	=	Critical percent of pedestrian crashes occurring at the given location during the previous 3 years (as defined by the current warrant criteria)
SI_{P1}	=	Severity index of pedestrian crashes occurring at the given location during the previous 3 years
$SI_{avg P1}$	=	Average severity index of pedestrian crashes occurring at the given location during the previous 3 years for all locations meeting Warrant P-1

NOTE:

If the location does not meet the criteria for any part of Warrant P-1 then the weighting factor of the location for this warrant is set equal to zero ($F_{P1} = 0$).

Warrant P-2: Darkness with Streetlights (Pedestrians)

In order for a pedestrian intersection location to be determined as potentially hazardous for pedestrian crashes occurring in darkness with streetlights, the location must meet all of the following criteria:

- At least 4 crashes involving pedestrians reported in the last 10 years of available data
- At least 30% of all crashes involving pedestrians must have occurred in the last 36 months
- At least 55% of all crashes involving pedestrians must have occurred during darkness with streetlights

The weighting method for Warrant P-2 is based on the frequency and severity of crashes at the location during darkness with streetlights compared to all other locations determined to be potentially hazardous for darkness with streetlights. The weighting factor for this warrant is calculated using the following formula:

$$F_{P2} = (N_i / N_c) * (P_i / P_c) * (SI_{P2} / SI_{avg P2})$$

Where:

F_{P2}	=	Weighting factor for Warrant P-2
N_i	=	Number of all pedestrian crashes that occurred at the given location in the previous 10 years
N_c	=	Critical number of crashes occurring at Warrant P-2 locations in the previous 10 years (as defined by the current warrant criteria)
P_i	=	Percent of pedestrian crashes occurring at the given location during darkness with streetlights
P_c	=	Critical percent of pedestrian crashes occurring at the given location during darkness with streetlights (as defined by the current warrant criteria)
SI_{P2}	=	Severity index of pedestrian crashes occurring at the given location during darkness with streetlights
$SI_{avg P2}$	=	Average severity index of pedestrian crashes occurring at the given location during darkness with streetlights for all locations meeting Warrant P-2

NOTE:

If the location does not meet the criteria for any part of Warrant P-2 then the weighting factor of the location for this warrant is set equal to zero ($F_{P2} = 0$).

Warrant P-3: Alcohol Involvement (Pedestrians)

In order for a pedestrian intersection location to be determined as potentially hazardous for pedestrian crashes involving alcohol, the location must meet all of the following criteria:

- At least 4 crashes involving pedestrians reported in the last 10 years of available data
- At least 30% of all crashes involving pedestrians must have occurred in the last 36 months
- At least 30% of all crashes involving pedestrians must have involved alcohol

The weighting method for Warrant P-3 is based on the frequency and severity of crashes at the location involving alcohol compared to all other locations determined to be potentially hazardous for alcohol involvement. The weighting factor for this warrant is calculated using the following formula:

$$F_{P3} = (N_i / N_c) * (P_i / P_c) * (SI_{P3} / SI_{avg P3})$$

Where:

F_{P3}	=	Weighting factor for Warrant P-3
N_i	=	Number of all pedestrian crashes that occurred at the given location in the previous 10 years
N_c	=	Critical number of crashes occurring at Warrant P-3 locations in the previous 10 years (as defined by the current warrant criteria)
P_i	=	Percent of pedestrian crashes occurring at the given location involving alcohol
P_c	=	Critical percent of pedestrian crashes occurring at the given location involving alcohol (as defined by the current warrant criteria)
SI_{P3}	=	Severity index of pedestrian crashes occurring at the given location involving alcohol
$SI_{avg P3}$	=	Average severity index of pedestrian crashes occurring at the given location involving alcohol for all locations meeting Warrant P-3

NOTE:

If the location does not meet the criteria for any part of Warrant P-3 then the weighting factor of the location for this warrant is set equal to zero ($F_{P3} = 0$).

Warrant P-4: Chronic Location (Pedestrians)

In order for a pedestrian intersection location to be determined as potentially hazardous for chronic pedestrian crashes, the location must meet the following criteria:

- At least 6 crashes involving pedestrians reported in the last 10 years of available data

The weighting method for Warrant P-4 is based on the frequency and severity of crashes at the location compared to all other locations determined to be potentially hazardous for chronic pedestrian crashes. The weighting factor for this warrant is calculated using the following formula:

$$F_{P4} = (N_i / N_c) * (SI_{P4} / SI_{avg P4})$$

Where:

F_{P4}	=	Weighting factor for Warrant P-4
N_i	=	Number of all pedestrian crashes that occurred at the given location in the previous 10 years
N_c	=	Critical number of crashes occurring at Warrant P-4 locations in the previous 10 years (as defined by the current warrant criteria)
SI_{P4}	=	Severity index of pedestrian crashes occurring at the given location in the previous 10 years
$SI_{avg P4}$	=	Average severity index of pedestrian crashes occurring at the give location in the previous 10 years for all locations meeting Warrant P-4

NOTE:

If the location does not meet the criteria for any part of Warrant P-4 then the weighting factor of the location for this warrant is set equal to zero ($F_{P4} = 0$).

Warrant X-1: Last 3 Years (Bicycles)

In order for a bicycle intersection location to be determined as potentially hazardous for an increased rate over the past 3 years, the location must meet all of the following criteria:

- At least 3 crashes involving bicycles reported in the last 10 years of available data
- At least 45% of all crashes involving bicycles must have occurred in the last 36 months

The weighting method for Warrant X-1 is based on the frequency and severity of crashes at the location during the previous 3 years compared to all other locations determined to be potentially hazardous for an increased crash rate. The weighting factor for this warrant is calculated using the following formula:

$$F_{X1} = (N_i / N_c) * (P_i / P_c) * (SI_{X1} / SI_{avg X1})$$

Where:

F_{X1}	=	Weighting factor for Warrant X-1
N_i	=	Number of all bicycle crashes that occurred at the given location in the previous 10 years
N_c	=	Critical number of crashes occurring at Warrant X-1 locations in the previous 10 years (as defined by the current warrant criteria)
P_i	=	Percent of bicycle crashes occurring at the given location during the previous 3 years
P_c	=	Critical percent of bicycle crashes occurring at the given location during the previous 3 years (as defined by the current warrant criteria)
SI_{X1}	=	Severity index of bicycle crashes occurring at the given location during the previous 3 years
$SI_{avg X1}$	=	Average severity index of bicycle crashes occurring at the given location during the previous 3 years for all locations meeting Warrant X-1

NOTE:

If the location does not meet the criteria for any part of Warrant X-1 then the weighting factor of the location for this warrant is set equal to zero ($F_{X1} = 0$).

Warrant X-2: Darkness with Streetlights (Bicycles)

In order for a bicycle intersection location to be determined as potentially hazardous for bicycle crashes occurring in darkness with streetlights, the location must meet all of the following criteria:

- At least 3 crashes involving bicycles reported in the last 10 years of available data
- At least 30% of all crashes involving bicycles must have occurred in the last 36 months
- At least 35% of all crashes involving bicycles must have occurred during darkness with streetlights

The weighting method for Warrant X-2 is based on the frequency and severity of crashes at the location during darkness with streetlights compared to all other locations determined to be potentially hazardous for darkness with streetlights. The weighting factor for this warrant is calculated using the following formula:

$$F_{X2} = (N_i / N_c) * (P_i / P_c) * (SI_{X2} / SI_{avg\ X2})$$

Where:

F_{X2}	=	Weighting factor for Warrant X-2
N_i	=	Number of all bicycle crashes that occurred at the given location in the previous 10 years
N_c	=	Critical number of crashes occurring at Warrant X-2 locations in the previous 10 years (as defined by the current warrant criteria)
P_i	=	Percent of bicycle crashes occurring at the given location during darkness with streetlights
P_c	=	Critical percent of bicycle crashes occurring at the given location during darkness with streetlights (as defined by the current warrant criteria)
SI_{X2}	=	Severity index of bicycle crashes occurring at the given location during darkness with streetlights
$SI_{avg\ X2}$	=	Average severity index of bicycle crashes occurring at the given location during darkness with streetlights for all locations meeting Warrant X-2

NOTE:

If the location does not meet the criteria for any part of Warrant X-2 then the weighting factor of the location for this warrant is set equal to zero ($F_{X2} = 0$).

Warrant X-3: Alcohol Involvement (Bicycles)

In order for a bicycle intersection location to be determined as potentially hazardous for bicycle crashes involving alcohol, the location must meet all of the following criteria:

- At least 3 crashes involving bicycles reported in the last 10 years of available data
- At least 30% of all crashes involving bicycles must have occurred in the last 36 months
- At least 35% of all crashes involving bicycles must have involved alcohol

The weighting method for Warrant X-3 is based on the frequency and severity of crashes at the location involving alcohol compared to all other locations determined to be potentially hazardous for alcohol involvement. The weighting factor for this warrant is calculated using the following formula:

$$F_{X3} = (N_i / N_c) * (P_i / P_c) * (SI_{X3} / SI_{avg\ X3})$$

Where:

F_{X3}	=	Weighting factor for Warrant X-3
N_i	=	Number of all bicycle crashes that occurred at the given location in the previous 10 years
N_c	=	Critical number of crashes occurring at Warrant X-3 locations in the previous 10 years (as defined by the current warrant criteria)
P_i	=	Percent of bicycle crashes occurring at the given location involving alcohol
P_c	=	Critical percent of bicycle crashes occurring at the given location involving alcohol (as defined by the current warrant criteria)
SI_{X3}	=	Severity index of bicycle crashes occurring at the given location involving alcohol
$SI_{avg\ X3}$	=	Average severity index of bicycle crashes occurring at the given location involving alcohol for all locations meeting Warrant X-3

NOTE:

If the location does not meet the criteria for any part of Warrant X-3 then the weighting factor of the location for this warrant is set equal to zero ($F_{X3} = 0$).

Warrant X-4: Chronic Location (Bicycles)

In order for a bicycle intersection location to be determined as potentially hazardous for chronic bicycle crashes, the location must meet the following criteria:

- At least 4 crashes involving bicycles reported in the last 10 years of available data

The weighting method for Warrant X-4 is based on the frequency and severity of crashes at the location compared to all other locations determined to be potentially hazardous for chronic bicycle crashes. The weighting factor for this warrant is calculated using the following formula:

$$F_{X4} = (N_i / N_c) * (SI_{X4} / SI_{avg\ X4})$$

Where:

F_{X4}	=	Weighting factor for Warrant X-4
N_i	=	Number of all bicycle crashes that occurred at the given location in the previous 10 years
N_c	=	Critical number of crashes occurring at Warrant X-4 locations in the previous 10 years (as defined by the current warrant criteria)
SI_{X4}	=	Severity index of bicycle crashes occurring at the given location in the previous 10 years
$SI_{avg\ X4}$	=	Average severity index of bicycle crashes occurring at the give location in the previous 10 years for all locations meeting Warrant X-4

NOTE:

If the location does not meet the criteria for any part of Warrant X-4 then the weighting factor of the location for this warrant is set equal to zero ($F_{X4} = 0$).

Overall Weighting Factor for Bicycle and Pedestrian Intersection Warrants

The weighting method for potentially hazardous for bicycle and pedestrian intersection locations is based on the individual weighting factors for each warrant. The overall weighting factor used to compare and prioritize for bicycle and pedestrian intersection locations that have been determined to be potentially hazardous is calculated using the following criteria or formula:

If the location meets any of bicycle and pedestrian intersection warrants P-1 through P-4 and/or X-1 through X-4, then the overall weighting factor for the location is:

$$F_{BP_INT} = F_{P1} + F_{P2} + F_{P3} + F_{P4} + F_{X1} + F_{X2} + F_{X3} + F_{X4}$$

Where:

F_{BP_INT}	=	Overall weighting factor for bicycle and pedestrian intersection warrants
F_{P1}	=	Weighting factor for Warrant P-1
F_{P2}	=	Weighting factor for Warrant P-2
F_{P3}	=	Weighting factor for Warrant P-3
F_{P4}	=	Weighting factor for Warrant P-4
F_{X1}	=	Weighting factor for Warrant X-1
F_{X2}	=	Weighting factor for Warrant X-2
F_{X3}	=	Weighting factor for Warrant X-3
F_{X4}	=	Weighting factor for Warrant X-4

If the location does not meet any individual warrants and their weighting factor is equal to zero, do not include them in the above formula.

If the location does not meet any of the section warrants then the overall weighting factor for the location is zero ($F_{BP_INT} = 0$)

APPENDIX E

Hazard Elimination Program Projects that Received Federal Funds in 2007

<u>County</u>	<u>Description</u>	<u>TIP Number</u>	<u>Amount Allocated</u>
Alamance	NC 49 and NC 119. Improve vertical alignment on NC 49, remove sight obstructions, and provide for channelization in the NW and SW quadrants to protect sight triangles.	W-5011	\$87,750
Beaufort	SR 1306 (15th Street) from 400' west of Washington Street to 400' east of Pierce Street. Widen the north side of SR 1306 from 48' face-to-face to 59' face-to-face curb and gutter.	W-5008	\$45,000
Bladen	NC 87 at SR 1700 (Mercer Mill Road) and SR 1145 (MLK) at NC 87. Construct directional crossovers and/or offsets with appropriate median U-turns.	W-5002	\$99,000
Brunswick	SR 1112 (Sunset Harbor Road). Install 2' paved shoulders, throughout the 16 curves located along SR 1112, on both sides of roadway.	W-4805	\$198,000
Brunswick	US 17-74-76 from SR 1722 to New Hanover County line. Install milled rumble strips along inside and outside shoulders along US 17-74-76 from SR 1722 to New Hanover County line. Install cable guide rail on US 17-74-76 from SR 1722 to 0.8 mile east of NC 133 and just west of the Cape Fear Memorial Bridge. (Length is approx. 7.3 miles.)	W-5009	\$337,500
Buncombe	I-240, entire length in Buncombe County. Install milled rumble strips on the median and outside shoulders.	W-4844	\$110,700
Burke	NC 18 from 0.3 mile north of SR 1926 southward 6.4 miles to 0.3 mile south of SR 1001. Install friction pavement overlay, rumble strips on the centerline and outside shoulders, and snow-plowable raised pavement markers. Install left turn lane at SR 1001. (Length is approx. 6.4 miles.)	W-5014	\$4,500
Cherokee	US 64-74 from the Tennessee state line to NC 60. US 19-74-129 from US 64 in Murphy to 0.3 mile east of US 19 Business, east of Andrews. Install milled rumble strips on the median and outside shoulders.	W-4848	\$189,000
Cleveland	SR 1001 (Stoney Point Road) from US 74 Bypass to SR 2033. Pave shoulders and widen lanes.	W-5013	\$45,000
Craven	US 70 from (1) SR 1323 to SR 1603 in Lenoir County, and (2) 0.3 mile west of NC 43 to the Trent River Bridge in Craven County. Construct milled-in rumble strips with thermoplastic striping (rumble stripes) on the median and outside shoulders of eastbound and westbound lanes.	W-4800	\$108,000
Cumberland	US 401 (Ramsey Street) from Law Road to SR 1611 (Andrews Road). Construct concrete islands, raised medians, directional crossovers and other channelization as necessary to reduce amount of uncontrolled cross movements.	W-5000	\$281,700

<u>County</u>	<u>Description</u>	<u>TIP Number</u>	<u>Amount Allocated</u>
Cumberland	US 13 from east of I-95 to the Sampson County line. Construct paved shoulders and turn lanes at various intersections.	W-5001	\$99,000
Cumberland	NC 87 at SR 2235/SR 2261 (Grays Creek Chr/Alderman) and NC 87 at SR 2233 (Butler Nursery). Install directional crossovers on NC 87 at SR 2235/SR 2261 and SR 2233.	W-5006	\$103,500
Duplin	I-40 from the Sampson County line to the Pender County line. Install 8"-12" milled rumble strips along both shoulders of I-40, in both directions, at a distance of approximately 0-12" from the edge line.	W-4802	\$220,500
Haywood	US 74 from I-40 to the Jackson County line. Install milled rumble strips on the median and outside shoulders.	W-4847	\$117,000
Henderson, Polk	I-26 from the Buncombe County line to the NC/SC state line (all of I-26 in Henderson and Polk Counties), and US 25 from the NC/SC state line to SR 1858 (Henderson County).	W-4845	\$211,500
Jackson	US 74/441, from a point +/- 0.30 mile east of SR 1391 to SR 1514/1387. Remove & replace 16' wide raised concrete island. Install median guardrail throughout the +3.4 miles (2 lines). Extend taper lengths at four of the existing crossovers. Construct new directional crossover WB to EB near Community Center. Install shoulder rumble strips along the entire section. Close or modify 5 existing full movement crossovers. Construct a right turn lane at SR 1388.	W-4713	\$5,570,879
Jackson	US 23-74 from 0.10 mile southwest of the Haywood County line to SR 1527. Install double-faced median guardrail in all the curves and along tangent sections where there is a history of cross median type crashes. Also, widen the paved shoulder by 4' in the areas where median guardrail is installed. Also, install +/- 1000' of single-faced guardrail in an area where a fatality occurred on 1/31/07. (Length is approx. 7.5 miles.)	W-5015	\$36,000
Jackson, Swain	US 74 from the Haywood County line to NC 28 (North). Install milled rumble strips on the median and outside shoulders.	W-4846	\$207,000
Johnston	US 70 in Clayton. Realign SR 1563 (Boiling Street) with SR 1004 and remove existing signal at SR 1563. Install traffic signals at US 70 at Moore Street and US 70 at John Street. Construct channelized "left-over" left turn lanes at US 70 at Durham Street and US 70 at South Smith Street.	W-4703	\$37,350
McDowell	I-40 from the Buncombe County line to 0.4 mile east of SR 1760. Install milled rumble strips on the median and outside shoulders.	W-4843	\$151,200
Mecklenburg	I-277 from its southernmost intersection with I-77 to its northernmost intersection with I-77. US 74 from I-277 to end of control access, a point 2 miles east of I-277. Install median and outside shoulder milled rumble strips.	W-4836	\$53,100

<u>County</u>	<u>Description</u>	<u>TIP Number</u>	<u>Amount Allocated</u>
New Hanover	SR 1219 (17th Street) from Savannah Court to SR 1101 (Shipyard Boulevard). Widen SR 1219 to match the existing six lane cross section. In addition, provide right turn lanes at northbound Wellington Avenue and Glen Mead Road.	W-4702	\$135,000
New Hanover	I-40 from the Pender County line to MP 420. Install 8"-12" milled rumble strips along both shoulders of I-40, in both directions, at a distance of approximately 0-12" from the edge line.	W-4803	\$40,000
Robeson	US 74 at the intersection of SR 2210. Convert existing at grade intersection to a grade separation.	W-4704	\$260,100
Rockingham	US 220 from NC 68, northward to the Virginia state line. Install shoulder rumble strips.	W-4819	\$137,858
Rockingham, Caswell	US 29 from US 29 Business in Rockinham County, northward through Caswell County to the Virginia state line. Install shoulder rumble strips.	W-4821	\$101,995
Rutherford, Polk, Cleveland	US 74 from I-26 in Polk County to US 74 Business in Cleveland County. Install milled rumble strips on the median and outside shoulders.	W-4841	\$269,100
Sampson	I-40 from the Johnston County line to the Duplin County line. Install 8"-12" milled rumble strips along both shoulders of I-40, in both directions, at a distance of approximately 0-12" from the edge line.	W-4806	\$90,900
Statewide	Safety Management Program, Project Identification, Analysis and Preliminary Engineering.	W-4447	\$4,050,000
Wake	SR 2000 (Wake Forest Road) at I-440 (Beltline). Widen SR 2000 (Wake Forest Road) for dual left turn lanes onto I-440 (Inner and Outer Beltline) and widen I-440 on-ramps to accept the dual left turn lanes. Revise existing traffic signals providing protected turn phase for dual left turn lanes.	W-4404	\$2,520,000
Wayne	(1) US 70 at SR 1234 (Ebenezer Church Road/Capps Bridge Road). (2) US 70 Crossover 0.35 mile west of SR 1234. Construct mainline directional crossovers at both locations with appropriate bulb-outs at adjacent crossovers to accommodate U-turns in accordance with the US 70 corridor study.	W-5010	\$103,500
Wilson	US 264: (1) East of Shepherd Branch Creek (MP 3.2 to 3.8), (2) West of I-95 (MP 4.2 to 4.6), (3) East of SR 1163 (MP 7.9 to 9), (4) East of US 301 (MP 9.7 to 10.5), (5) near SR 1526 (MP 22.3 to 22.9). Resurface target areas with an open-graded friction course.	W-5007	\$877,500
Wilson, Nash	I-95 from 0.1 mile north of SR 1309 (MM123.1) in Wilson County to SR 1524 (MM 142.9) in Nash County. Construct milled-in rumble strips on the median and outside shoulders of northbound and southbound lanes.	W-4807	\$476,100

Total Number of Projects:

34

Total Expenditures:

\$17,375,232

APPENDIX F

Hazard Elimination Program Projects On Hold at End of 2007

County	Description	File Number	Total Project Cost
Alamance	US 70 (S. Church St.) from approx. 295 feet west of the US 70 and Carolina Ave./Willowbrook Dr. intersection eastward to approx. 245 feet east of the US 70 and Fountain Place intersection. Construct a left turn lane on US 70 from approx. 50 feet west of Carolina Ave./Willowbrook Dr. eastward to Fountain Place. Provide 245 feet tapers for transition turn lanes. Widen 12 feet asymmetrically to the north side of US 70 to construct turn lane.	07-00-215	\$1,322,500
Alamance	NC 87 at SR 1558 (Old NC 87). Construct a left turn lane on northbound NC 87 approach of the intersection. Realign SR 1558 to improve the skew angle.	07-02-210	\$605,000
Buncombe	NC 63 from SR 1389 to the Madison County line. Install 2' paved shoulders and resurface NC 63 from SR 1389 to the Madison County line.	13-07-213	\$1,400,000
Buncombe	NC 197 from US 19-23 (future I-26) eastward 9.5 miles. Install 2' paved shoulders on NC 63 from US 19-23 to a point 0.1 mile west of SR 2172.	13-07-214	\$2,000,000
Cabarrus	SR 1335 (Old Charlotte Road) and Union Cemetery Road in Concord. Install left turn lanes on all approaches of intersection. Upgrade signal to an 8-phase with protected-permitted movements.	10-07-005	\$945,000
Carteret	US 70 from SR 1301 (Shell Landing Road) to 0.15 mile south of SR 1238 (E. Carteret High School Entrance). Widen US 70 to provide for a continuous left turn lane.	02-02-208	\$2,350,000
Caswell	NC 62 from the PC north of SR 1111 (Byrds Sawmill Rd.) to PT south of SR 1759 (Roscoe Dameron Rd.) Improve horizontal alignment of the compound curves on NC 62 in the vicinity of SR 1759 and SR 1111. Add 2' paved shoulders and resurface.	07-07-218	\$1,964,000
Cherokee	NC 141 from US 64 to US 74. Install paved shoulders along both sides of NC 141. Install left turn lanes at SR 1520, SR 1531 and the NCDOT Maintenance facility. (Length is approx. 8.1 miles.)	14-06-211	\$1,870,000
Cleveland	NC 150 from SR 1123 to SR 1253. Install left turn lanes at the intersections and add a 3' paved shoulder from 300 feet west of SR 1127 to 250 feet east of SR 1253.	12-99-013	\$1,636,000
Columbus	US 74 at SR 1574 (Old US 74 Road) near Whiteville. Construct directional crossover with appropriate median U-turns on US 74 at SR 1574.	06-06-210	\$962,500
Cumberland	SR 1615 (Rosehill Road) from 440 feet north of US 401 Bypass to 230 feet south of SR 1614 (Shaw Mill Road). Widen existing two lane road to a three lane section and install signal at SR 1615 and Tamarack	06-02-210	\$1,920,000

County	Description	File Number	Total Project Cost
Davie	I-40 from the Iredell County line eastward to SR 1436, a distance of 12.9 miles. Resurface travel lanes with Novachip macrotexture surfacing to correct wet pavement crashes.	09-05-211	\$2,777,500
Forsyth	US 52 (NC 8) from MP 1.3 to MP 4.20. Resurface with Novachip macrotexture surfacing to correct wet pavement crashes.	09-05-214	\$785,000
Franklin	NC 98 at SR 1001 (Pearces Road). Realign SR 1001 to form a 90 degree intersection with NC 98, reduce the vertical crest curve on NC 98 east of the intersection by two feet, install left turn lanes on NC 98 and reduce the embankments on NC 98. Re-install the actuated flasher.	05-08-210	\$947,000
Franklin, Vance	US 1 from SR 1135 (Wall Road) in Franklin County to US 1 Business in Vance County. Install median barrier.	05-04-202	\$1,800,000
Greene	US 258 from 330' north of SR 1117 to 0.5 mile south of SR 1101. Widen US 258 to provide a left turn lane.	02-01-278	\$850,000
Hertford	NC 11 at SR 1212 and SR 1213. Construct a grade separation with a two-way ramp in the southwest quadrant that can be utilized following the future construction on two additional lanes on NC 11.	01-07-201	\$6,230,000
McDowell	US 221 (Marion Bypass) from NC 226 to US 70. Install concrete median barrier and rumble strips on the median and outside shoulders. (Length is approx. 5.1 miles.)	13-07-206	\$2,795,000
Mecklenburg	US 21 (Statesville Road) and SR 2136 (Gilead Road) near exit 23 on I-77. Install dual left turn lanes on Gilead Road for both approaches. Install dual left turn lanes on NB US 21. Install additional through lanes on US 21 to support dual lefts from Gilead Road. Upgrade existing signal.	10-07-006	\$3,650,000
Moore	NC 24/27 at SR 1809/SR 1814. Lower the grade on the west leg of NC 24/27 to improve the sight distance.	08-08-203	\$687,500
New Hanover	SR 1148 (Wrightsville Ave.) and Country Club Road/Colonial Drive. Widen for left turn lanes along Wrightsville Ave. and install protected left turn signal phasing.	03-03-206	\$1,485,000
Onslow	NC 24 and SR 1744 (Hubert Blvd.)/SR 1587 (Waterfront) near Swansboro. Convert existing full movement crossover to a superstreet design.	03-07-212	\$687,500
Onslow	SR 1501 (Sandridge Road) from SR 1509 to Buckhead Road. Widen SR 1501 (Sandridge Road) to a three lane section and resurface roadway. (Length is approx. 1.6 miles.)	03-07-218	\$1,980,000
Onslow	SR 1501 (Sandridge Road) from Buckhead Road to MP 3.13. (Length is approx. 1.5 miles.)	03-07-219	\$2,035,000
Onslow	SR 1470 (Western Blvd.) and Circuit Lane. Install off-set left turn lanes along SR 1470 and upgrade the existing signals to flashing yellow arrow signal heads.	03-07-227	\$533,500

County	Description	File Number	Total Project Cost
Rockingham	US 220 and SR 1110 south of Madison and the first median opening on US 220 approx. 3200 feet south of the intersection of US 220 and SR 1110. Provide a limited movement crossover, construct a bulb out, and upgrade two existing left turn lanes.	07-07-206	\$506,550
Rockingham	US 220 from NC 68 northward for approx. 18.26 miles to the Virginia State line. Install two lines of single face guardrail in the median of US 220.	07-07-214	\$3,200,000
Scotland	US 501 and SR 1614. Realign SR 1614 EB leg to a location south of the existing intersection. Widen US 501 to three lanes throughout the affected section.	08-08-202	\$850,000
Union	SR 1364 (Pleasant Plains Road) at SR 1357 (Potters Road). Install left turn lanes on all four approaches and modify traffic signal from permissive turning movements to protected turning movements.	10-07-008	\$775,000
Vance,Warren	I-85 from US 158 in Vance County northward to the Virginia State line. (Length = 20.3 miles.) Reconstruct the median paved shoulders, widen the median paved shoulders to four feet in width, and install continuous milled rumble strips on the median paved shoulders. All proposed improvements apply to both directions on I-85. (Length is approx. 25 miles.)	05-07-208	\$4,425,000
Wake	SR 1152 (Holly Springs Road) from SR 1385 (Lilly Atkins Road) northward to SR 1383 (Campbell Road). Construct a three-lane	05-02-223	\$630,000
Wake	NC 50 from I-540 northward to SR 1831 (Old Creedmoor Road). Install guardrail.	05-04-204	\$772,000
Wake	SR 2215 (Buffaloe Road) at SR 2228 (Old Crews Road). Lower the crest vertical curve on Buffaloe Road just east of its intersection with Old Crews Road.	05-05-215	\$741,500
Wake	SR 1010 from SR 3851 (South Mountain Dr.) to Cary Lee Road. Realign SR 1010 to flatten two horizontal curves.	05-07-226	\$660,000
Total Number of Projects: 34		Total Costs:	\$56,778,050

APPENDIX G: 2007 Funded Spot Safety Projects (All Funding Sources)

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>	<i>Funding Source</i>
01	Bertie	US 13-17 from Martin County to SR 1521.	Project WBS 39466. \$120,000 has previously been approved for milled-in rumble stripe installation on US 13-17 from Martin County to SR 1521. Due to constructability issues and being unable to secure funds to add paved shoulders and resurface, this project cannot be built at this time. Delete project and reduce funds.	01-04-202-1	(\$120,000)	State
01	Currituck	NC 168 from US 158 to the Virginia State Line near Moyock.	Install rumble stripes on both sides of center left turn lane.	01-06-208	\$247,500	State
01	Currituck	US 158 at SR 1147 (Indiantown Road)	Replace the existing overhead flasher with an all-way "Vehicle Entering" flasher.	01-07-200	\$60,000	State
01	Dare	US 158 (Croatan Highway) at SR 1206 (Kitty Hawk Road).	Revise existing protected/permitted left-turn control with a green ball on both approaches of US 158 to protected/permitted utilizing a flashing yellow arrow. Revise clearance timing in accordance with new "Vehicle Interval Timing Calculations" (Std. 5.2.2). Upgrade pedestrian signal heads to pedestrian countdown heads. Upgrade traffic signal to coastal standards and provide required height clearances for the 4-section flashing yellow arrow left-turn signal heads by replacing the wood poles with metal poles. Widen both approaches of SR 1206 to provide improved alignment and lane storage.	01-06-210	\$97,000	HES
01	Dare	SR 1217 (Colington Road) at SR 1452 (Baum Bay Drive).	Construct a left turn lane on SR 1217 into SR 1452.	01-06-211	\$200,000	State
01	Dare	SR 1217 (Colington Road) at the Methodist Church northwest of SR 1490 (Williams Drive) near Kill Devil Hills.	Realign SR 1217 to remove severe horizontal curve.	01-06-213	\$250,000	State

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01	Gates/Pasquot	US 158 from SR 1002 to Gates County to SR 1356 in Pasquotank County.	Project WBS 40119. \$115,000 has previously been approved for milled-in rumble stripe installation on US 158 from SR 1002 to Gates County to SR 1356 in Pasquotank County. Due to constructability issues and being unable to secure funds to add paved shoulders and resurface, this project cannot be built at this time. Delete project and reduce funds.	01-04-203-1	(\$115,000)	State
01	Hertford	US 13/NC 42 north of SR 1420 at bridges #12 and #25 near Ahoskie.	1) Install appropriate approach and departure guardrail at both bridges, while retrofitting each bridge rail and installing guardrail between the bridges. 2) Install "Bridge Ices Before Road" warning signs on both approaches of US 13/NC 42 and a curve warning sign on southbound US 13/NC 42.	01-06-207	\$135,500	State
01	Martin	US 13-64 at NC 125 (Prison Camp Rd.) and future Roberson Business Park.	Project WBS 31621. \$50,000 has previously been approved for traffic signal installation on US 13-64 at NC 125 (Prison Camp Road) and future Roberson Business Park. Project was deleted due to uncertainty of business park. Delete project and decrease funds. File 01-99-218.	01-99-218-1	(\$50,000)	State
01	Northampton	NC 305 at Jackson Elementary School Drive east of US 158.	Project WBS 31623. \$25,000 has previously been approved for lane and shoulder construction on NC 305 at Jackson Elementary School Drive. Project was built with other funds. Delete project and decrease funds. File 01-00-219.	01-00-219-1	(\$21,939)	State
01	Pasquotank	NC 344 (Halstead Boulevard Ext.) at SR 1307 (Forest Park Road) in Elizabeth City.	Install a traffic signal.	01-06-202	\$150,000	State
02	Carteret	SR 1176 (20th Street) from Bridges Street to the southern end of SR 1179 (Mayberry Loop Road).	Widen for paved shoulders.	02-04-205	\$250,000	State
02	Carteret	US 70 at western intersection with SR 1247 (Chatham Street).	Channelize US 70 median to allow left turns from eastbound US 70 onto SR 1247 and left turns from SR 1247 onto eastbound US 70 including construction of an acceleration lane eastbound on US 70.	02-06-209	\$230,000	State
02	Craven	US 70 at SR 1124/1125 (Grantham Road).	Construct a mainline leftover and remove the two adjacent crossovers to the west.	02-07-202	\$165,000	State
02	Jones	SR 1004 from US 17 to the Craven County Line near Pollocksville.	Widen SR 1004 approximately 3 feet to provide 1.5 foot paved shoulders, overlay, and restripe pavement markings.	02-06-207	\$250,000	State

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02	Jones	US 258 in the vicinity of NC 41.	Increase the superelevation on the curve and overlay with a friction course.	02-06-210	\$143,000	State
02	Lenoir	US 70 just west of NC 58 south.	Extend the existing grassed median island to allow only right in/right out access to the middle convenience store driveway.	02-07-201	\$5,000	State
02	Lenoir	NC 58 from Jones County Line to SR 1929, a length of 4.99 miles.	Construct paved shoulders	02-07-204	\$250,000	State
02	Lenoir	NC 58 from SR 1929 to US 70, a length of 2.37 miles.	Construct paved shoulders.	02-07-205	\$250,000	State
02	Pitt	NC 903 at SR 1131.	Project WBS 40738. \$15,000 has previously been approved for drainage ditch relocation and paved shoulder installation on NC 903 at SR 1131. Additional funds are needed due to an increase in construction costs. File 02-04-207.	02-04-207-1	\$20,000	State
02	Pitt	NC 11 (Memorial Drive) from SR 1128 (Davenport Farm Road) to Mall Drive.	Extend the 7 existing left turn lanes at 5 median openings.	02-04-209	\$245,000	State
03	Brunswick	NC 130 and SR 1134 (Gray Bridge Road).	Project WBS 40826.3. \$110,000 has previously been approved for traffic signal installation at the T-intersection of NC 130 and SR 1134 (Gray Bridge Road). Project scope needs to be changed to realign SR 1136 (Red Bug Road) to form a crossroads with SR 1134 and install a traffic signal at the new crossroads intersection. Additional funds are needed due to the scope change. File 03-04-210.	03-04-210-1	\$140,000	State
03	Brunswick	US 17 and SR 1184 (Ocean Isle Beach Road).	Install directional crossovers along US 17 at the intersection of SR 1184.	03-04-220	\$223,000	State
03	Brunswick	US 17 (Ocean Boulevard) and SR 1130 (Mt. Pisgah Road).	Install directional left-overs on US 17 at SR 1130.	03-06-213	\$145,000	State
03	Brunswick	US 74/76 and NC 87 (Maco Road)/ SR 1419 (Northwest Road).	Install Long Vehicle Detection.	03-06-215	\$30,000	State

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03	Brunswick	NC 133 (River Road) from the intersection with SR 1551 (Blackwell Road/ Main Street) to the intersection with US 74/76 eastbound on-ramp in Belville.	Convert existing thru lane to a right turn lane which will establish a dual right turn at the intersection with US 74/76 on ramp. Install concrete island to convert the intersection with SR 1551 to directional left turns.	03-07-204	\$85,000	HES
03	Brunswick	US 17 at US 17 Business/ Frontage Road near Shallotte	Install Advance Signal Ahead Warning Signs with actuated flashers and long vehicle detection to the existing signal.	03-07-213	\$47,000	State
03	Duplin	SR 1911 (Lanefield Road) in vicinity of elementary school.	Install left turn lane.	03-05-206	\$142,000	State
03	New Hanover	SR 1322 (Kerr Avenue) at US 117/NC 133.	Project 36527. \$40,000 has previously been approved for right turn lane construction on SR 1322 (Kerr Avenue) at US 117/NC 133. This project will now be built by a Developer. Delete project and reduce funds.	03-02-205-1	(\$35,714)	State
03	New Hanover	US 76 (Wooster Street) with intersections 6th Street and 8th Street in Wilmington.	Install a two phase traffic signal at the intersection of 8th and Wooster and install a longhorn concrete island at the intersection of 6th and Wooster.	03-06-214	\$80,000	State
03	New Hanover	SR 1322 (Bavarian) from SR 1175 (Kerr Avenue) to NC 132 (College road) near Wilmington.	Install a traffic signal at the intersection of SR 1322 and SR 1175. Install additional left turn lanes on SR 1322 in the EB direction and on NC 132 in the NB direction. Extend the right turn lanes in the NB on NC 132 and EB on SR 1322. Install concrete island on SR 1322 from NC 32 past SR 1327.	03-07-208	\$178,000	State
03	New Hanover	NC 132 (College Road) and SR 1272 (New Center Drive) in Wilmington.	Add an additional northbound left turn lane along northbound NC 132.	03-07-210	\$151,000	HES
03	New Hanover	SR 1141 (Wrightsville Avenue) at McMillan Street in Wilmington	Project WBS 31692. \$150,000 has previously been approved to widen, construct left turn lanes and revise the traffic signal at SR 1141 (Wrightsville Avenue) at McMillan Street. Due to right of way and utility issues, this project cannot be built at this time. Delete project and reduce funds.	03-99-211-2	(\$147,672)	State
03	Onslow	SR 1308 (Gum Branch Road) from 0.2 mile east of SR 1353 eastward to SR 1986.	Widen SR 1308 to a three lane cross-section and resurface.	03-07-209	\$173,000	State
03	Pender	US 17 and SR 1561 (Sloop Point Road).	Convert the existing full movement crossover to directional left-overs and install a northbound U-turn location with a bulb-out.	03-06-217	\$202,000	State

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03	Sampson	NC 24 in the vicinity of SR 1292.	Project 40381. \$46,000 has previously been approved for installing superelevation on the curve, resurfacing, shoulder reconstruction and pavement markings installation on NC 24 in the vicinity of SR 1292. District Office funds have been used to install a friction course on the pavement which has significantly reduced wet crashes. Delete project and reduce funds due to reduced crashes.	03-05-200-1	(\$46,000)	State
04	Edgecombe	US 258 at US 64 westbound ramps.	Install a traffic signal	04-06-221	\$40,000	State
04	Johnston	US 70 at NC 42 E.	Project WBS 31724. \$150,000 has previously been approved for construction of turn lanes at US 70 and NC 42E. Project was built with other funds. Delete project and decrease funds. File 04-00-225.	04-00-225-1	(\$145,436)	State
04	Johnston	I-40 eastbound exit ramp at NC 42.	Project WBS 31735. \$199,000 has previously been approved for widening on I-40 eastbound exit ramp at NC 42. Project was built with other funds. Delete project and decrease funds. File 04-02-221.	04-02-221-1	(\$162,096)	State
04	Johnston	NC 210 at I-40 westbound ramps near Smithfield.	Install a traffic signal with protected-permissive left turns on northbound NC 210, and interconnect to the existing signal at the eastbound ramps and the planned signal at the intersection of NC 210 and SR 1382 (North Pleasant Coats Road).	04-05-201	\$75,000	State
04	Johnston	NC 210 at SR 1532 (White Memorial Church Road) near Angier.	Improve vertical alignment on westbound NC 210 at SR 1532 (White Memorial Church Road) in order to provide safe approach and entering sight distance.	04-05-213	\$100,000	State
04	Johnston	NC 42 at SR 1705 (Castleberry Road) and Bridge #75 over the Neuse River.	1) Install double-indicated "Prepare to Stop" warning signs with flashers on eastbound NC 42 at the west end of Bridge #75. 2) Widen the paved shoulder on eastbound NC 42 from the east end of Bridge #75 departure guardrail, eastward for 250 feet to the entrance to Flowers Plantation Welcome Center.	04-05-218	\$50,000	HES
04	Johnston	SR 1010 (Cleveland School Road) at SR 1525 (Cornwallis Road) near Clayton.	Provide protected/permitted left turn phase on SR 1010.	04-06-206	\$3,500	State

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04	Johnston	SR 1923 (Booker Dairy Road) between Eden Drive and White Oak Drive/Bradford Street in Smithfield.	1) Construct 2 foot paved shoulders and regrade soil shoulders along both sides of SR 1923 between Eden Drive and Camelia Drive. 2) Pipe the roadway ditch along the north side of SR 1923 between Eden Drive and Camelia Drive. 3) Repaint all pavement markings and install edgeline and center line raised pavement markers from Eden Drive to White Oak Drive/Bradford Street.	04-06-212	\$45,000	State
04	Johnston	NC 210 west of Smithfield in the vicinity of bridges #59 and #72 over Swift Creek.	1) Install appropriate approach and departure guardrail at both bridges, while retrofitting each bridge rail and installing guardrail between the bridges. 2) Install new pavement markers and markings. 3) Install a "Vehicle Entering When Flashing" warning system on NC 210 at SR 1010.	04-06-214	\$190,000	State
04	Johnston	SR 1555 (Barber Mill Road) near SR 1556 (Government Road) at Bridge #145 near Clayton.	Install an electronic "Your Speed" radar sign on southbound SR 1555 to advise motorists of their speed entering the curve, replace the existing chevron warning signs on southbound SR 1555 with oversized chevron signs, and install additional oversized chevron warning signs on southbound SR 1555 behind the approach guardrail of bridge #145.	04-06-215	\$10,000	State
04	Johnston	SR 1555 (Barber Mill Road) near SR 1556 (Government Road) at Bridge #145 near Clayton.	Project 41253.3. \$9,000 has previously been approved for "Your Speed" radar sign installation and chevron warning sign improvements on SR 1555 (Barber Mill Road) near SR 1556 (Government Road) at Bridge #145 near Clayton. In order to also improve sight distance, additional funds and a scope change are needed to regrade the backslope of the curve.	04-06-215-1	\$3,000	State
04	Johnston	NC 42 at SR 1902 (Glen Laurel Road).	Construct a left turn lane	04-06-217	\$150,000	State
04	Johnston	SR 1553 (Shotwell Road) from US 70 to 0.2 mile north of US 70.	Widen SR 1553 and construct an island from US 70 to beyond the entrance to Bojangles, overlay with a surface course and stripe.	04-06-220	\$70,000	State
04	Johnston	US 301 (Bright Leaf Blvd.) at North Street	Install countdown pedestrian signal heads and crosswalk.	04-07-216	\$10,000	State
04	Nash	US 301 from 0.85 to 2.2 miles south of SR 1516 (Johnston Road) near Rocky Mount.	Install rumble strips with thermoplastic pavement markings on both shoulders and guardrail on all ends of bridges 80, 141 and 151.	04-05-200	\$50,000	State
04	Nash	SR 1544 (Halifax Road) at SR 1604 (Hunter Hill Road) near Dortches.	Construct left turn lanes on SR 1544 and install a traffic signal.	04-05-220	\$125,000	State

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04	Nash	NC 97 (Raleigh Road) at West Haven Boulevard.	Install a crosswalk on the eastern leg of NC 97 (Raleigh Rd.) and add 2 pedestrian heads to existing signal 04-0116.	04-07-200	\$10,000	HES
04	Nash	US 64 eastbound lanes from mile marker 452 to mile markers 453, east of NC 581.	Overlay with asphalt mix of appropriate type to provide good drainage and increase skid resistance.	04-07-206	\$100,000	State
04	Wayne	NC 581 (Arrington Bridge Road) at SR 1919 (Westbrook Road) near Goldsboro.	Install a traffic signal.	04-06-204	\$40,000	HES
04	Wayne	US 13 at SR 1705 (Hood Swamp Road) near Goldsboro.	Construct a left turn lane on US 13 southbound and install a signal.	04-06-205	\$240,000	State
04	Wilson	SR 1602 (Charleston Road) and SR 1607 (Stantonsburg Road).	Project WBS 31755. \$50,000 has previously been approved for traffic signal installation at SR 1602 (Charleston Road) and SR 1607 (Stantonsburg Road). Project was built with other funds. Delete project and decrease funds. File 04-01-244.	04-01-244-1	(\$49,309)	State
05	Franklin	US 401 at SR 1100 (Tarboro Road).	Construct left turn lanes on US 401, remove the slip ramps on all four quadrants and install a traffic signal.	05-06-228	\$250,000	State
05	Granville	NC 96 at SR 1700 (Brassfield Road)/SR 1709 (Horseshoe Road) - Cross Reference File #05-04-215.	Project WBS 40708. \$165,000 construction funds has previously been approved for installation of a roundabout on NC 96 at SR 1700 (Brassfield Road)/SR 1709 (Horseshoe Road). Due to a substantial project cost estimate increase for the roundabout, a scope revision with reduction of construction funds is needed. Revise scope to installation of overhead actuated flasher.	05-03-051-1	(\$140,000)	State
05	Wake	SR 1009 (Tryon Road) at SR 1321 (Avent Ferry Road).	Install a traffic signal with metal strain poles and a protected-permitted left turn phase for eastbound SR 1009 (Tryon Road).	05-03-216	\$75,000	State
05	Wake	US 1 (Capital Boulevard) at US 1A (Main Street)/(New Falls of Neuse Road).	Construct an additional left turn lane on eastbound New Falls of Neuse Road.	05-04-201	\$86,000	HES
05	Wake	US 401 at SR 2724 (Banks Road).	Install a traffic signal and construct a right turn lane for westbound Banks Road.	05-04-208	\$150,000	State
05	Wake	SR 1152 (Holly Springs Road) at SR 1305 (Arthur Pierce Road)/SR 1389 (Pierce Olive Road).	Construct a left turn lane on northbound SR 1152 at SR 1305.	05-04-229	\$90,000	State

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05	Wake	NC 97 at SR 2329 (Marshburn Road).	Construct turn lanes for each approach of NC 97 and SR 2329 (Marshburn Road.)	05-04-406	\$240,000	State
05	Wake	SR 2000 (Falls of Neuse Road) at Morrocroft Drive, Falls Pointe Shopping Center.	Install a traffic signal and interconnect to existing signal system.	05-05-205	\$60,000	State
05	Wake	NC 98 at SR 1945 (Averette Road).	Construct left turn lanes on NC 98 and install a traffic signal.	05-05-209	\$236,500	State
05	Wake	SR 1152 (Holly Springs Road) south of SR 1379 (Penny Road).	Project WBS 40859.3. \$175,000 has previously been approved for horizontal curve realignment on SR 1152 (Holly Springs Road) south of SR 1379 (Penny Road). Additional funds are needed due to an increase in construction costs. File 05-06-204.	05-06-204-1	\$55,000	State
05	Wake	NC 96 in the vicinity of US 64.	Install a traffic signal on NC 96 at US 64 Eastbound Ramps, and install a closed loop signal system for the intersections of NC 96 at US 64 Westbound Ramp/Dogwood Dr., NC 96 at US 64 Eastbound Ramps, and NC 96 at Wakelon St./Apothecary Dr.	05-06-212	\$75,000	State
05	Wake	US 70 (Glenwood Avenue) at Marriott Drive.	Install high visibility ped crossing on east leg of Glenwood with countdown ped heads. Replace existing crossing on west leg with high visibility crosswalk and countdown heads. Install high visibility crosswalk on Marriott Drive.	05-06-230	\$59,000	State
05	Wake	SR 3466 (West Millbrook Road) at Davis Circle.	Install a directional crossover.	05-06-232	\$52,500	State
05	Wake	SR 1571 (Gorman Street) from Thistledown Drive to SR 1370 (Tryon Road).	Upgrade signal controllers, install GPS clocks, install protected left-turn phases and upgrade signing and pavement markings.	05-07-204	\$50,000	State
05	Wake	US 1 (Capital Boulevard) at Paragon Park Rd. and US 1 (Capital Boulevard) at SR 3046 (Homestead Dr.)	Close the southbound left turn movement on US 1 at Paragon Park Rd., lengthen the northbound left turn storage on US 1 at Paragon Park Rd. to 480 ft. full and 200 ft. taper), and construct a directional crossover at US 1 and Homestead Dr. allowing for northbound u-turns only.	05-07-205	\$166,000	State
05	Wake	SR 1647 (Ebenezer Church Road) at Marvino Lane	Install a traffic signal with provisions for pedestrians and interconnection to the Closed Loop Signal System on US 70 (Glenwood Avenue) at SR 1647 (Ebenezer Church Road.)	05-07-210	\$75,000	State

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06	Bladen	Bridge # 188 on SR 1316 (Tar Heel Ferry Road) over Cape Fear River, North of NC 87 Bridge # 189 in the vicinity of NC 87 near Tarheel.	Install guardrail on the approach and trailing ends of Bridge # 188 and 189.	06-03-213	\$39,000	State
06	Bladen	NC 20 and SR 1300 (Chicken Foot Road).	Install standard overhead flasher.	06-05-207-1	\$3,000	State
06	Bladen	SR 1003 (Twisted Hickory Rd) from 0.1 miles north of SR 1150 (Peanut Plant Road) to 1.5 miles south of SR 1111 (Race Track Road) near Elizabethtown.	Realign SR 1003 (Twisted Hickory Rd) to reduce the curvature of the current alignment.	06-06-212	\$230,000	State
06	Bladen	NC 87 at US 701 near Elizabethtown.	Install shoulder mounted actuated flashers with "Be Prepared to Stop" signing on NC 87, in both directions prior to the signalized intersection of NC 87 and US 701.	06-06-213	\$26,000	State
06	Bladen	US 701 at culvert located approximately 0.8 mile south of SR 1142 (Campbell Rd) near Clarkton.	Install guardrail on both sides of US 701 at the culvert for 500 feet.	06-07-209	\$37,200	State
06	Columbus	US 74 at NC 211 near Bolton.	Install shoulder mounted actuated flashers with "Be Prepared to Stop" signing on both approaches of US 74.	06-07-202	\$26,000	State
06	Cumberland	SR 1106 (Bailey Lake Road) at SR 1104 (Strickland Bridge Road) located outside the Fayetteville city limits.	Project WBS 40860.3. \$139,000 has previously been approved for left turn lane construction on SR 1106 (Bailey Lake Road) at SR 1104 (Strickland Bridge Road). Additional funds are needed due to an increase in construction costs.	06-04-200-1	\$40,000	State
06	Cumberland	US 401 Bus. (MLK) 0.3 miles west from the intersection of US 401 Bus. (MLK) and US 401 Bus. (Ramsey Street).	Install a overhead cantilever warning sign with flashers on north bound US 401 Bus (MLK).	06-04-210	\$49,000	State
06	Cumberland	SR 1005 (Smithfield Road) from NC 82 to Sampson County Line.	Construct two foot paved shoulders around the bridge and extend the guardrail in the vicinity of bridge number 58.	06-04-222	\$122,000	State
06	Cumberland	NC 59 (Hope Mills Road) at SR 1003 (Camden Road) in Hope Mills.	Upgrade the existing signal on NC 59 to include fully protective left turn movements.	06-06-209	\$4,000	State
06	Cumberland	SR 1404 (Morganton Road) at SR 1403 (Reilly Road) in Fayetteville.	Install concrete islands along all approaches for approximately 300 feet.	06-06-211	\$76,000	State
06	Cumberland	US 401 at SR 1593 (Hoke Loop Road) in Fayetteville.	Install signal with flashing yellow indication.	06-07-201	\$110,000	State

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06	Cumberland	US 401 (Ramsey St.) from approximately 300 feet south of the intersection of US 401 (Ramsey) and US 401 Bypass (Country Club) to Law Road.	Install concrete island on US 401 (Ramsey St.) from approximately 300 feet South of US 401 (Ramsey St.) and US 401Bypass (Country Club) to Law Road with breaks at signalized intersections.	06-07-205	\$216,000	State
06	Cumberland	SR 1141 (Cumberland Road) from NC 59 (Hope Mills Road) to approximately SR 1135 (John Smith Road).	Install concrete island along SR 1141 from NC 59 to approximately SR 1135. Install a modified directional island at SR 1141 and SR 1135 to only allow left turns from SR 1141 onto SR 1135. SR 1135 will be a right in right out only.	06-07-206	\$238,000	HES
06	Harnett	SR 1121 (Ray Road) and SR 1120 (Overhills Rd)	Install a 2 phase signal on wood poles and utilize the existing pavement width to establish left turn lanes on SR 1120. This would be accomplished by resurfacing and restriping the intersection.	06-05-004	\$235,000	State
06	Robeson	NC 41 at SR 1954 (Moore's Lane) near Lumberton.	Install a left turn lane on north bound NC 41.	06-06-207	\$227,000	State
06	Robeson	NC 41 at SR 1954 (Moore's Lane) near Lumberton.	Project WBS 41519.2.1. NC 41 at SR 1954 (Moore's Lane) near Lumberton. Right of way and utility funds are needed for left turn lane construction.	06-06-207-1	\$60,000	State
06	Robeson	NC 41 at SR 1954 (Moore's Lane) near Lumberton.	Project WBS 41261.2. \$60,000 in right of way and utility funds has previously been approved for left turn lane construction at NC 41 and SR 1954 (Moore's Lane) near Lumberton. Funds are to be taken down and reapplied to R-5017 for the same work and location.	06-06-207-2	(\$60,000)	State
06	Robeson	NC 41 at SR 1954 (Moore's Lane) near Lumberton.	Project WBS 41261.3. \$167,000 has previously been approved for left turn lane construction at NC 41 and SR 1954 (Moore's Lane) near Lumberton. Funds are to be taken down and reapplied to R-5017 for the same work and location.	06-06-207-3	(\$167,000)	State
06	Robeson	NC 41 at SR 1954 (Moore's Lane) near Lumberton.	Project WBS 41519.3.1. NC 41 at SR 1954 (Moore's Lane) near Lumberton. Construction funds are needed for left turn lane construction.	06-06-207-4	\$167,000	State
06	Robeson	US 72 at SR 1515 (St. Anna Road) near Pembroke.	Install actuated flasher at intersection with actuation on NC 72 and provide "Vehicle Entering When Flashing" on SR 1515. Also install a continuous flashing beacon for the stop signs on SR 1515.	06-07-204	\$116,000	State

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06	Robeson	US 74 from Scotland County Line in Robeson County to US 74 Bus. near Maxton.	Install milled rumble strips on inside and outside paved shoulders and install median guiderail for approximately 2.9 miles.	06-07-212	\$239,000	State
07	Guilford	SR 2565 (Hicone Road) at SR 2790 (Eckerson Road) near Greensboro.	Construct left turn lanes on SR 2565 (Hicone Road).	07-01-211	\$150,000	State
07	Guilford	SR 2334 (Air Harbor Road) and SR 1001 (North Church Street near Greensboro.	Install traffic signal with mast arms; remove island to create a left turn lane on Air Harbor.	07-03-212	\$20,000	State
07	Guilford	SR 2131 (Northwest School Road) at SR 2128 (Bunch Road) near Summerfield.	Construct right turn lane with concrete median on Northwest School Road.	07-05-243	\$149,000	State
07	Guilford	SR 2187 (Jessup Grove Road) and SR 2124 (Lewiston Road) near Greensboro.	Install traffic signal at intersection and construct a right turn lane for northbound Lewiston Road traffic to turn east onto Jessup Grove Road.	07-06-201	\$159,500	State
07	Orange	SR 1104 (Dairyland Road) culvert over Morgan Creek.	Project WBS 31907. \$32,500 has previously been approved for guardrail installation on SR 1104 (Dairyland Road) culvert at Morgan Creek. Project was built with other funds. Delete project and decrease funds. File 07-01-009.	07-01-009-1	(\$32,500)	State
07	Orange	NC 86 and SR 1332 (Coleman Loop Road) near Hillsborough.	Construct a left turn lane on northbound NC 86.	07-01-209	\$110,000	State
07	Orange	NC 57 at NC 157 near Hillsborough.	Install center traffic islands with stop signs on NC 157. Improve sight distance by moving mail boxes back and run c&g down the sides to maintain sight distance.	07-01-217	\$95,000	HES
07	Orange	NC 57 at NC 157 near Hillsborough.	NC 57, at NC 157, Orange County. Install center traffic islands with stop signs and make sight distance improvements.	07-01-217-1	\$71,000	HES
07	Orange	US 70 (Hillsborough Road) and NC 751 near Durham.	Install a right turn lane for traffic travelling east on US 70 and turning right onto NC 751.	07-04-207	\$130,000	HES
07	Orange	SR 1009 (Old NC 86) and SR 1113 (Arthur Minnis Rd.)/SR 1723 (New Hope Church Road.)	Project WBS 40531. \$49,500 has previously been approved for intersection improvements and four-way stop installation at SR 1009 (Old NC 86) and SR 1113 (Arthur Minnis Road)/SR 1723 (New Hope Church Road). Additional funds are needed due to an increase in construction costs. File 07-05-249.	07-05-249-1	\$8,151	State

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>	<i>Funding Source</i>
07	Orange	NC 54 and SR 1952 (White Cross Road) near Carrboro.	Project WBS 41026.3. \$173,000 has previously been approved for left turn lane construction at NC 54 and SR 1952 (White Cross Road) near Carrboro. Additional funds are needed due to an increase in construction costs.	07-06-205-1	\$66,000	State
07	Orange	NC 54 and SR 1945 (Neville Road) near Carrboro.	Construct a left turn lane on NC 54. The turn lane will be 100 feet of full storage with 50 feet full storage for decel.	07-06-206	\$138,600	State
07	Rockingham	NC 87/Barnes Street (SR 2817) and NC 87/Holiday Loop (SR 2594).	Project WBS 39501. \$75,000 has previously been approved for concrete island installation and pavement marking revisions at NC 87/Barnes Street (SR 2817) and NC 87/Holiday Loop (SR 2594). Additional funds are needed due to an increase in construction costs. File 07-04-201.	07-04-201-1	\$46,000	State
07	Rockingham	SR 1914 (Oregon Hill Road), SR 1925 (Worsham Mill Road), and SR 1980 (Mt. Carmel Church Road).	Project WBS 39502. \$50,000 has previously been approved for traffic island installation at SR 1914 (Oregon Hill Road), SR 1925 (Worsham Mill Road), and SR 1980 (Mt. Carmel Church Road). Project scope needs to be changed to installation of a flasher due to high right of way costs involved with traffic island installations. No additional funds are needed. File 07-04-204.	07-04-204-1	\$0	State
07	Rockingham	US 220 Business northbound, approximately 0.2 mi. south of SR 1395 near the Town of Mayodan.	Install solar powered flashing beacon to existing northbound curve warning and 40 mph speed plate sign assembly.	07-07-203	\$10,000	State
07	Rockingham	Horizontal curve on SR 2308 (Bald Hill Loop Road) 0.2 mile west of SR 2313 (Martin Farm Road) near Madison.	Installation of 560 linear feet of guardrail, shoulder improvements to include widening, flattening sideslopes, and removal of trees from roadside.	07-07-204	\$111,400	State
08	Chatham	US 64 at NC 751/SR 1001 (New Hill Road) near Pittsboro.	Install a flashing yellow arrow indication for the left turns on US 64 and inaugurate a time of day program to switch the left turn from permissive movement to a protected movement during peak times.	08-06-214	\$13,500	State
08	Chatham	NC 751 and SR 1731 (O'Kelly Church Road) northeast of Pittsboro.	Install protected-permitted traffic signal with wood poles at the intersection of NC 751 and SR 1731. Install left turn lane on northern leg of NC 751.	08-06-218	\$146,000	HES
08	Hoke	NC 211 at SR 1105 (Old Wire Road) outside of Raeford.	Install left turn lanes on NC 211. Wedge and grade the eastern leg of SR 1105 to improve sight distance. Complete additional clearing on the southern leg of NC 211 along the inside of curve.	08-06-211	\$249,000	State

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>	<i>Funding Source</i>
08	Hoke	US 401 at SR 1207 (John Russell Road) near Raeford.	Install actuated flasher with vehicles entering when flashing signs on US 401. SR 1207 will maintain a red indication at all times and the amber flash for US 401 only when vehicles enter.	08-06-215	\$30,000	State
08	Hoke	US 401 at SR 1409 (Lake Park Road) and SR 1303 (Scull Road) near Raeford.	Construct a directional crossover to reduce angle type crashes.	08-06-219	\$240,000	HES
08	Lee	SR 1001 (Lemon Springs Road) and SR 1146 (Saint Andrew Road) near Sanford.	Revise existing flasher to a four-way stop flasher, with advance Stop Ahead flashers and Stop sign flashers on SR 1001.	08-07-201	\$11,000	HES
08	Moore	NC 211 and SR 1216 (Juniper Lake Road) west of Pinehurst near Taylor Town.	Install signal on wood poles at intersection of NC 211 and SR 1216.	08-06-210	\$43,000	State
08	Randolph	US 64 (Dixie Drive) from SR 1154 (Country Club) to Ragsdale.	Install back plates on signals along US 64 from SR 1154 to Ragsdale.	08-06-212	\$10,000	State
08	Randolph	Bridge # 306 over Little River on SR 1121 (New Hope Church Road) near Asheboro.	Install guardrail on both approach and trailing ends of Bridge #306 for approximately 500 feet.	08-06-213	\$27,500	State
08	Randolph	NC 49 at SR 2456 (Whites Chapel Road) / SR 2470 (Old Staley Road) near Staley.	Install a overhead vehicle actuated flasher with additional ground mounted actuated flasher with vehicle entering signing on NC 49.	08-06-217	\$29,500	State
08	Randolph	NC 49 at SR 2456 (Whites Chapel Road) / SR 2470 (Old Staley Road) near Staley.	Project 41396.3. \$28,500 construction funds has previously been approved for actuated flasher installation and signing on NC 49 at SR 2456 (Whites Chapel Road)/SR 2470 (Old Staley Road) near Staley. Additional funds are needed due to unforeseen utility conflicts.	08-06-217-1	\$60,000	State
08	Randolph	SR 2237 (Salisbury St) at SR 2184 (Coleridge)/ SR 2194 (Dublin Square Road).	Modify the grade on the eastern leg of SR 2237 due to angle type pattern.	08-07-203	\$191,000	HES
08	Scotland	SR 1425 (Lee's Mill Rd) at SR 1323 (High Land).	Install a standard overhead flasher on wood poles.	08-05-207-1	\$4,000	State
09	Davidson	NC 8 and SR 1412 (Walser Road).	Install traffic signal with railroad preemption.	09-05-210	\$60,000	State
09	Davidson	NC 109 and SR 2266 (Hannerville Road/Clarksbury Ch. Road) south of Thomasville.	Install left turn lanes on NC 109 on both approaches to SR 2266. Left turn lanes to have 150' of storage each and appropriate tapers.	09-07-202	\$201,000	HES

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>	<i>Funding Source</i>
09	Davidson	SR 2183 (Fisher Ferry Road/Denton Road) and SR 2097 (Mt. Zion Church Road/Noahtown Road) south of Thomasville.	Improve sight distance with combination of vertical realignment and reduced skew angle.	09-07-203	\$200,000	HES
09	Davidson	Northbound I-85 in the vicinity of SR 2205 (Old US 64).	Install approximately 0.75 mile of friction course overlay approaching and through horizontal curve.	09-07-205	\$150,000	State
09	Davidson	Northbound I-85 in the vicinity of SR 2205 (Old US 64).	Project WBS 41636.3. \$150,000 has previously been approved for friction course installation on I-85 Northbound in the vicinity of SR 2205 (Old US 64). Additional funds are needed due to an increase in the cost of materials.	09-07-205-1	\$60,000	State
09	Davidson	NC 150 and SR 1508 (Hickory Tree/Old Salisbury Roads) in Davidson County just south of Winston-Salem.	Install two 4-section flashing yellow arrow protected-permitted signal heads. One head to be located over southbound NC 150 left turn lane to eastbound SR 1508. The other head to be located over northbound NC 150 left turn lane to westbound SR 1508.	09-07-207	\$20,000	State
09	Davie	US 601 at SR 1307 (Ijames Church Road) near Mocksville.	Construct left turn lane.	09-05-202	\$211,000	State
09	Forsyth	US 421 NB Ramp/I-40 Bus/US 158 and Broad Street in Winston-Salem.	Project WBS 31957. \$25,000 has previously been approved for traffic installation at US 421 NB Ramp/I-40 Bus/US 158 and Broad Street in Winston-Salem. Project was built with other funds. Delete project and decrease funds. File 09-00-211.	09-00-211-1	(\$25,000)	State
09	Rowan	NC 152 and SR 1211 (Patterson/Brown Road).	Project WBS 40716.3 NC 152 and SR 1211 (Patterson/Brown Road). \$48,233 has previously been approved for traffic signal installation at NC 152 and SR 1211 (Patterson/Brown Road). Additional funds are needed due to an increase in construction costs. File 09-05-213.	09-05-213-1	\$11,514	State
09	Rowan	NC 152 and SR 1350 (Millbridge Road/Saw Road) near China Grove.	Installation of traffic signal with wood poles.	09-06-205	\$35,000	State
09	Rowan	US 29 and SR 2539 (Peach Orchard Road).	Construct right turn lane for northbound US 29 traffic at SR 2539.	09-07-204	\$80,000	HES
10	Cabarrus	I-85 Northbound Ramp and SR 2180 (Lane Street).	Install fully actuated traffic signal. 2 phase.	10-04-212	\$48,000	HES
10	Cabarrus	NC 73 at bridge approaches over Little Cold Water Creek.	Installation of guardrail on both approaches to the bridge.	10-06-200	\$42,000	State

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>	<i>Funding Source</i>
10	Cabarrus	SR 2180 (Lane Street) at Wright Avenue.	Upgrade existing flasher to a 2 phase fully actuated traffic signal.	10-06-201	\$55,000	State
10	Mecklenburg	SR 4982 (Polk Street) from South of Lee Street northward to NC 51 (Pineville-Matthews Road).	Install Median Barrier System to restrict left turns into and out of Lee Street.	10-06-202	\$49,500	State
10	Mecklenburg	SR 2693 (Davidson-Concord Road) and SR 2420 (Rocky River Road).	Install 2 phase fully actuated traffic signal, realign the intersection so that the southern leg on Davidson-Concord Road forms a true tee intersection, install a westbound left turn lane on Rocky River Road and a eastbound right turn lane on Davidson-Concord Road.	10-06-205	\$250,000	State
10	Mecklenburg	NC 115 (Old Statesville Road) and SR 2459 (Eastfield Road).	Installation of fully actuated signal.	10-07-202	\$49,000	State
10	Mecklenburg	NC 218 (Fairview Road) and SR 3106 (Brief Road).	Installation of fully actuated signal with interconnect to signal at I-485 interchange.	10-07-203	\$73,000	State
10	Mecklenburg	NC 49 and SR 1120 (Erwin Road) south of Charlotte.	Project WBS 31984. \$55,000 has previously been approved for turn lane construction on NC 49 at SR 1120 (Erwin Road). Project was built with other funds. Delete project and decrease funds. File 10-97-006.	10-97-006-1	(\$53,109)	State
10	Union	SR 1315 (New Town Road) and SR 1309 (Crane Road).	Install 2 phase fully actuated traffic signal and construct left turn lanes on all 4 approaches.	10-06-203	\$250,000	State
10	Union	SR 1315 (New Town Road) and SR 1007 (Rocky River Road).	Install turn lanes and signal.	10-07-210	\$240,000	State
10	Union	SR 1315 (New Town Road) at SR 1008 (Waxhaw-Indian Trail Road).	Install 2 phase fully actuated traffic signal.	10-07-215	\$65,000	State
11	Ashe	US 221 Bus. at SR 1149 (Mount Jefferson Road) near West Jefferson.	Install traffic signal.	11-06-206	\$47,000	State
11	Ashe	US 221 at SR 1149 (Mt. Jefferson Road).	Install limited movement crossover.	11-07-203	\$65,000	State
11	Caldwell	SR 1001 (Connely Springs Road) at SR 1115 (Dry Ponds/Premier Road) near Connely Springs.	Installation of traffic signal and construct monolithic island along store frontage.	11-06-202	\$135,000	State
11	Caldwell	US 64/NC18 at SR 1142 (Calico Road).	Construct left turn lanes on US 64/NC18, remove/revise channelization on SR 1142, and install a traffic signal.	11-06-203	\$100,000	State

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>	<i>Funding Source</i>
11	Surry	US 52 from Stokes County line to US 52 Business. (12.5 miles)	Install shoulder rumble strips.	11-07-200	\$140,000	HES
11	Surry	US 52 Bypass at SR 1772 (Old Buck Shoals Road).	Construct limited movement crossover to restrict crossing maneuvers.	11-07-202	\$100,000	HES
11	Wilkes	NC 16/18 and SR 2545 (Plaza Drive) near North Wilkesboro.	Widen NC 16/18 to provide a left turn lane.	11-02-221	\$151,000	HES
11	Wilkes	NC 115/US 421 Bus. at SR 2318 (Old 60) near North Wilkesboro.	Construct a south bound left-turn lane on NC 115/US 421 Bus. at SR 2318 (Old 60).	11-04-203	\$229,000	State
12	Alexander	US 64 at SR 1610 (Millersville Road).	Construct left turn lanes on side streets.	12-06-207	\$55,000	State
12	Catawba	SR 1005 (Startown Road) and SR 2007 (West Maiden Street).	Replace flasher with a 2-phase signal.	12-06-204	\$20,000	State
12	Catawba	SR 1006 (Oxford School Rd.) at SR 1709 (Rockbarn Rd.)	Install an overhead flasher	12-07-205	\$22,000	State
12	Cleveland	NC 180/226 at SR 1103 (Pleasant Hill Church Road).	Construct left turn lanes on NC 180/226	12-06-206	\$141,000	State
12	Gaston	NC 274 from the S.C. line to SR 2435. (2.12 miles).	Widen travel lanes and add paved shoulders. (2 foot widening on each side.)	12-06-205	\$250,000	State
12	Gaston	I-85 NB on ramp from NC 7 (Ozark Avenue).	Skid overlay with guardrail at bridge abutments.	12-06-209	\$110,000	State
12	Iredell	NC 115, from 0.2 mile south of SR 1871 to 0.4 mile south of SR 1800.	Project WBS 39219. \$150,000 has previously been approved for guardrail installation on NC 115 from 0.2 mile south of SR 1871 to 0.4 mile south of SR 1800. Additional funds are needed due to an increase in construction costs.	12-02-202-1	\$21,396	State
12	Iredell	SR 1109 (Williamson Road) at SR 1190 (Sundown Road) near Mooresville.	Construct NB left turn lane on SR 1109.	12-06-208	\$157,000	HES
12	Iredell	Bridge # 480182 on SR 2171 (Jane Sowers Road).	Install/upgrade guardrail at bridge.	12-07-200	\$13,000	State
12	Iredell	US 21 at SR 1302 (Cornelius Road).	Install traffic signal and construct NB left turn lane on US 21.	12-07-201	\$61,000	State

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>	<i>Funding Source</i>
13	Buncombe	I-26 Eastbound off ramp at NC 280.	Project WBS 40536. \$200,000 has previously been approved for turn lane construction and traffic signal installation on I-26 Eastbound off ramp at NC 280. Additional funds are needed due to an increase in construction costs. File 13-05-206.	13-05-206-1	\$30,000	State
13	Buncombe	US 25/70 from US 19/23 in Buncombe County to north of NC 251 in Madison County near Weaverville.	Install rumble strips on the median and outside paved shoulders.	13-06-204	\$110,000	State
13	Buncombe	NC 197 at SR 2160 (Sugar Creek Road) near Barnardsville.	Install an actuated flasher.	13-06-207	\$15,000	State
13	Buncombe	SR 1003 (Reems Creek Road) from US 19/23 Business to SR 2121 near Weaverville.	Install guardrail.	13-06-208	\$140,000	State
13	Buncombe	NC 251 from SR 1781 to the Madison County Line. Length of Project = 12.05 miles.	Install guardrail at select locations on NC 251.	13-06-211	\$245,000	State
13	Burke	US 70 at US 64.	Install an exclusive right turn lane on EB US 70 to provide adequate storage for the movement.	13-03-210	\$200,000	State
13	Burke	I-40 in the vicinity of SR 1755 (Coldwater Road) overpass. Length of project = 0.45 mile.	Resurface the shoulders to lessen the 8% rollover and reset the existing guardrail. Also, add additional warning devices in both directions of I-40.	13-07-204	\$240,000	State
13	Madison	US 25/70 at SR 1145 (Sharp Hollow Road) near Marshall.	Construct left turn lane on US 25/70.	13-06-201	\$245,000	State
13	Madison	I-26 at Exit 9 (US 19) near Mars Hill.	Project WBS 41033.3. \$20,000 has previously been approved for guardrail installation on I-26 at Exit 9 (US 19) near Mars Hill. Additional funds are needed due to an increase in the amount of required guardrail. File 13-06-205.	13-06-205-1	\$20,000	State
13	McDowell	NC 226 from NC 226A to the Mitchell County line.	Upgrade and actuate existing truck speed warning flasher and upgrade signing.	13-07-208	\$175,000	State
13	Mitchell	NC 226 at SR 1117 (Carter's Ridge Road) near Spruce Pine.	Install a fully actuated traffic signal with metal poles.	13-04-210	\$110,000	State

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>	<i>Funding Source</i>
13	Mitchell	US 19E just west of SR 1122 in Spruce Pine.	Project WBS 41032.3. \$157,000 has previously been approved for continuous left turn lane construction on US 19E just west of SR 1122. Additional funds are needed due to an increase in the cost of materials.	13-06-206-1	\$53,000	State
13	Rutherford	SR 2178 (Hardin Road) at Westview Street/Westwood Drive in Forest City.	Install a four-way stop with additional pavement markings and warning devices.	13-07-201	\$5,000	State
13	Rutherford	SR 1510 (Hudlow Rd.) at SR 1538 (Whitesides Rd.) near Rutherfordton.	Upgrade existing actuated flasher to warn motorists on both Hudlow and Whitesides Road when vehicles are entering the intersection.	13-07-202	\$30,000	State
13	Rutherford	US 74EB from the Broad River eastward for 0.50 mile.	Resurface roadway with an open-graded friction course to correct rutting problem on this section of roadway.	13-07-203	\$100,000	HES
14	Clay	US 64 at SR 1305 (Qualla Road) and SR 1126 (North Carter Road) near Hayesville.	Construct left and right turn lanes on US 64.	14-06-208	\$245,000	State
14	Clay	US 64 Bus. at NC 69/SR 1313.	Remove channelization and build a roundabout at the intersection.	14-07-203	\$200,000	State
14	Haywood	I-40 from the Tennessee state line to MM 15; I-40 from Exit 27 to the Buncombe County Line. Length = +/- 23 miles.	Install rumblestrips on both shoulders along these two portions of I-40.	14-07-209	\$210,000	State
14	Henderson	NC 280 at SR 1690 (Broadpointe Drive).	Install an actuated traffic signal and extend the existing acceleration lane in the eastbound direction of NC 280.	14-03-215	\$235,000	State
14	Henderson	NC 280 at SR 1690 (Broadpointe Drive).	Project 41642.3. \$235,000 construction funds has previously been approved for island construction and improvements to accommodate U-turns on NC 280 at SR 1690 (Broadpointe Drive). Revise scope to traffic signal installation at NC 280 and SR 1690 (Broadpointe Drive) and widening. No additional funds are needed.	14-03-215-1		State
14	Henderson	SR 1345 (North Mills River Road) near Mills River.	Install shoulder guardrail.	14-06-206	\$132,000	State
14	Henderson	SR 1734 (Sugarloaf Road) at SR 1735 (Blue House Road).	Realign skewed intersection and improve sight distance.	14-06-209	\$110,000	State
14	Henderson	SR 1114 (Pinnacle Mountain Road) at NC 225.	Realignment of intersection.	14-07-004	\$65,000	State

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>	<i>Funding Source</i>
14	Jackson	US 23-441 from SR 1300, northward for 2000', near Sylva.	Improve pavement cross-section and add a friction course pavement overlay.	14-07-001	\$160,000	State
14	Polk	NC 9 at NC 108 near Columbus.	Install a traffic signal with metal poles.	14-07-204	\$125,000	State

Total Number of Projects: 189

Total Expenditures: \$17,951,486

***Key for Funding Source:** State = State funds, HES = federal HSIP funds*

APPENDIX H : "On Hold" (Unfunded) Spot Safety Program Projects at End of 2007

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>
01	Bertie	NC 11-42 at bridge #24, 1.6 miles north of NC 308.	Upgrade existing guardrail to current standards with M-350 anchor units.	01-07-204	\$35,000
01	Currituck	NC 12 at Currituck Clubhouse Drive and Schooner Ridge Road.	Install a traffic signal.	01-07-003	\$65,000
01	Martin	US 64 Alt. at NC 125 (Prison Camp Road).	Install a two-phase traffic signal	01-07-206	\$60,000
01	Pasquotank	SR 1101 (Peartree Road) in vicinity of SR 1135 (Blount Road).	Improve super-elevation of the curve on SR 1101 in the vicinity of SR 1135.	01-07-207	\$125,000
02	Carteret	US 70 at SR 1147 (McCabe Road).	Construct a mainline leftover.	02-06-204	\$190,000
02	Carteret	US 70 (Arendell Street) at SR 1749/1182 (24th Street).	Widen the railroad crossing for an additional lane from southbound SR 1749 (24th St.) onto the Atlantic Beach Causeway and revise the existing traffic signal.	02-07-203	\$20,000
02	Carteret	SR 1176 (Bridges Street) at SR 1602 (35th Street) & Noyes Avenue/Maple Lane.	1) Upgrade protected-permitted left turn display to flashing yellow arrow at 35th Street. 2) Revise traffic signal clearance interval timing to current standards at 35th Street. 3) Install pedestrian crosswalk on the west leg of SR 1176 (Bridges Street) with count-down heads. 4) Install advance "Prepare to Stop" blank-out sign on east leg of SR 1176 (Bridges Street) near Maple Lane.	02-07-210	\$75,000
02	Craven	US 17-70/NC 55 bridges over the Trent River and US 17/NC 55 bridges over the Neuse River.	Install five closed-circuit television cameras four sets of static warning signs with remote activated flashers, and three dynamic message signs.	02-07-001	\$250,000
02	Craven	NC 101, 0.8 mile west of SR 1717.	Install 250' of guardrail and 2 GRAU's on each side of the roadway.	02-07-215	\$15,500
02	Pitt	SR 1467 (Stantonsburg Road) at W.H. Smith Boulevard.	Install a traffic signal with metal poles and mast arms compatible with the Greenville Signal System. Remove existing signal at SR 1467 (Stantonsburg Rd.) and Emergency Drive.	02-02-232	\$200,000
03	Brunswick	NC 211 and SR 1115 (Stone Chimney Road).	Install a traffic signal at the intersection and extend the right turn lane along the northbound leg of SR 1115.	03-07-225	\$137,000
03	Brunswick	NC 87 at SR 1539 (E. Boiling Springs Road) in Boiling Springs.	Install a right turn lane on northbound NC 87, install right turn lane on westbound SR 1539, and increase the length of the southbound left turn lane on NC 87.	03-07-229	\$104,000

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>
03	New Hanover	US 421 (Carolina Beach Road) and SR 1197 (Silver Lake Road/Shade Tree Lane) near Wilmington.	Install traffic signal with protective/permitted phasing.	03-03-205	\$244,000
03	New Hanover	SR 1576 (River Road)/ SR 1531 (Sea Breeze Road) at US 421 (Carolina Beach Road) near Carolina Beach.	Install traffic signal with a protected-permitted left turn phase on US 421.	03-06-212	\$180,000
03	New Hanover	US 17 Business (Market Street) at SR 2734 (Marsh Oaks Drive) near Wilmington.	Install traffic signal with protected/ permitted phasing for the southbound left turn movements along US 17 Business.	03-07-205	\$200,000
03	New Hanover	US 76 (Oleander Drive) and Greenville Loop Road (non-system) in Wilmington.	Install four section flashing yellow arrow signal heads for the protected/ permitted left turn movements from US 76.	03-07-223	\$5,000
03	Onslow	NC 210 from the end of the curb and gutter section at Dixon Middle School to NC 172 for a total distance of 3.5 miles.	Install 2' paved shoulders along each side of NC 210.	03-04-221	\$184,000
03	Onslow	NC 53 and SR 1109 (Holly Shelter Road).	Install a left turn lane along NC 53 and realign SR 1109 to form more of a "T" intersection instead of a skewed intersection.	03-06-202	\$177,000
03	Onslow	SR 1213 (Blue Creek Rd) from SR 1269 (Walnut Drive) to SR 1212 (Pony Farm Road) near Jacksonville.	Construct 2 foot paved shoulders and install vibralline the entire length of SR 1213.	03-07-216	\$227,000
03	Onslow	SR 1107 (Dawson Cabin Road) from SR 1147 to US 17.	Install 2' paved shoulders along SR 1107 (Dawson Cabin Road) from SR 1147 to US 17.	03-07-222	\$83,000
03	Onslow	NC 24 and SR 1511 (Hammocks Beach Road) near Swansboro.	Install a right turn lane along SR 1511	03-07-228	\$53,000
03	Onslow	NC 53 (Burgaw Highway) at SR 1212 (Pony Farm Road)/ SR 1113 (Murrill Hill Road) near Jacksonville.	Convert the existing signal design to a split side street phasing.	03-07-230	\$7,000
03	Pender	I-40 Ramp terminal and NC 210.	Install traffic signal to help alleviate the congestion of traffic backing up down the I-40 ramp.	03-07-231	\$159,000
03	Sampson	SR 1233 (Bonnetsville) bridge over Bearskin Swamp.	Remove and replace the existing bridge and install the necessary guardrail along the approaches.	03-02-220	\$225,000
04	Halifax	NC 43 at SR 1346 (Rosser Home Road).	Wedge curve on NC 43 to improve superelevation.	04-07-232	\$80,000

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>
04	Johnston	SR 1010 (Cleveland Road) at SR 1514 (McLemore Road) near Smithfield.	Install a traffic signal.	04-05-210	\$45,000
04	Johnston	SR 1938 (Brown's Pond Road) at SR 2127 (Shoeheel Road) and SR 2131 (Rhondale Road).	Install a "Vehicle Entering" flasher.	04-06-222	\$40,000
04	Johnston	NC 210 at SR 1309 (Old Fairgrounds Road).	Construct left turn lanes on NC 210 and install a traffic signal.	04-07-003	\$245,000
04	Johnston	NC 50 at relocated SR 1524 (Old Drug Store Road).	Construct left turn lanes on NC 50, relocate existing signal, add protected-permissive left-turn phase and improve timing.	04-07-220	\$150,000
04	Nash	US 301 from 0.56 mile north to 0.78 mile north of SR 1733 through Cokey Swamp.	Install guardrail on both sides of US 301	04-07-201	\$14,500
04	Nash	NC 43/48 (Benvenue Road) at Thorpe Road.	Install a traffic signal and concrete island on northbound NC 43/48.	04-07-209	\$70,000
04	Nash	SR 1603 (Old Carriage Road) at US 64 WB ramps.	Install a traffic signal.	04-07-218	\$40,000
04	Nash	NC 58 at SR 1145 (Old Spring Hope Road).	Construct left turn lanes on both approaches of NC 58.	04-07-221	\$100,000
04	Nash	NC 43/48 (Benvenue Road) from NC 48 (Gold Rock Road) to the US 301 southbound ramps, a length of 0.44 mile.	Construct monolithic islands and install delineators between each existing signalized intersection.	04-07-222	\$125,000
04	Nash	SR 1544 (Halifax Road) at SR 1765 (Community Drive).	Construct a left turn lane on northbound SR 1544 (Halifax Road).	04-07-224	\$80,000
04	Wayne	US 70 westbound at SR 1302 (Florida St.) and Paul Street.	Remove access to westbound US 70 from SR 1302 (Florida St.) and Paul St.	04-07-208	\$70,000
04	Wayne	US 117 Alternate South in front of the U.S. Post Office near Dudley.	Construct a left turn lane for motorists entering the post office.	04-98-209	\$125,000
05	Durham	SR 1966 (Lumley Road) at SR 1973 (Page Road).	Install a three-phase fully actuated traffic signal.	05-07-224	\$40,000
05	Durham	SR 1110 (Farrington Rd.) at SR 1113 (Ephesus Church Rd.)	Install a three-phase traffic signal with a protected-permitted left turn phase for northbound SR 1110 (Farrington Rd.).	05-07-238	\$45,000
05	Franklin	US 1 at SR 1135 (Wall Road).	Install a traffic signal with metal strain poles and interconnect to US 1 Closed Loop Signal System (Wake/Franklin Counties).	05-05-207	\$100,000

<i>Division</i>	<i>County</i>	<i>Description of Location</i>	<i>Project Improvement Description</i>	<i>File No.</i>	<i>Amount Requested</i>
05	Franklin	NC 96 at SR 1141 (Pocomoke Road)/SR 1127 (Bruce Garner Road).	Install an actuated flasher.	05-07-227	\$25,000
05	Granville	NC 96, 0.50 mile south of SR 1705 (Old Franklinton Road).	Realign horizontal curve.	05-05-214	\$245,000
05	Vance	US 158 Bypass at SR 1126 (Poplar Creek Road).	Install a vehicle-actuated flasher.	05-07-209	\$20,000
05	Wake	NC 50 (Creedmoor Road) at SR 1834 (Norwood Road).	Construct left turn lane on westbound SR 1834 (Norwood Road) and revise traffic signal providing a protected-permitted left turn phase.	05-01-208	\$210,000
05	Wake	SR 1002 (Aviation Parkway) at International Drive.	Install a traffic signal.	05-02-217	\$50,000
05	Wake	SR 2768 (Judd Parkway) at SR 3736 (Old Honeycutt Road).	Install a traffic signal.	05-02-221	\$50,000
05	Wake	NC 50 (Benson Road) at SR 3718 (Turner Farm Road)/Wakefield Lane).	Construct left turn lanes on NC 50 at this intersection.	05-04-225	\$235,000
05	Wake	NC 50 at SR 2703 (New Bethel Church Road).	Install a traffic signal.	05-04-228	\$50,000
05	Wake	SR 1010 (Ten Ten Road) at SR 1152 (Holly Springs Road).	Construct a right turn lane with 200 ft. full storage and 180 ft. taper for westbound SR 1010 at the subject intersection.	05-05-020	\$160,000
05	Wake	SR 2002 (Raven Ridge Road)/Anson Grove Road at SR 2006 (Durant Road).	Install a traffic signal with metal strain poles and interconnect to the Durant Road Closed Loop Signal System.	05-05-206	\$90,000
05	Wake	SR 2006 (Perry Creek Road) at Filbin Creek Drive/Liston Drive.	Install a traffic signal.	05-05-210	\$45,000
05	Wake	SR 2012 (Litchford Road) at Coxindale Drive.	Install a traffic signal.	05-05-219	\$45,000
05	Wake	US 70 at SR 2558 (Guy Road).	Widen the northbound approach of Guy Road to accommodate dual left turn lanes with 250 ft. of storage, and revise signal to accommodate split side street phasing.	05-06-206	\$229,500
05	Wake	SR 2224 (Mitchell Mill Road) at SR 4253 (Neuse Crossing Drive).	Install a two-phase traffic signal and connect to US 401 signal system at Mitchell Mill Road.	05-06-231	\$71,000
05	Wake	SR 1435 (Old Raleigh Road) at Apex Peakway.	Install a traffic signal.	05-07-027	\$40,000

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05	Wake	Northbound US 70/US 401/NC50/SR1513 (McDowell Street) Exit Ramp at SR 1012 (Western Blvd / Martin Luther King, Jr. Parkway).	Install approximately 220 feet of steel beam guardrail along north shoulder of exit ramp.	05-07-211	\$39,316
05	Wake	NC 50 at SR 1901 (Old Weaver Trail).	Install a 3-phase traffic signal.	05-07-212	\$50,000
05	Wake	NC 97 at SR 2406 (Shepard School Road)/Poplar Street.	Install a traffic signal.	05-07-213	\$45,000
05	Wake	SR 1348 (Trailwood Road) at SR 1355 (Lineberry Dr./Canine Tech Way in Raleigh.	Install an overhead actuated flasher.	05-07-229	\$25,000
05	Wake	SR 1315 (Buck Jones Road) at Farmgate Road.	Restripe SR 1315 (Buck Jones Road) for a turn lane at Farmgate Road	05-07-230	\$7,500
05	Wake	SR 1006 (Old Stage Road) in the vicinity of Widget Lane and in the vicinity of SR 2759 (Barbour Store Road).	Widen, Improve Superelevation, Re-surface, and Re-stripe	05-07-234	\$216,000
05	Wake	SR 1615 (High House Road) at SR 3011 (Jenks-Carpenter Road).	Install a traffic signal.	05-98-222	\$50,000
05	Wake	SR 2012 (Litchford Road) at Scouting Trail in Raleigh.	Install a fully actuated traffic signal.	05-99-202	\$50,000
05	Wake	Bridge #20 on NC 97 at the Wake/Franklin County Line.	Install standard guardrail (approach length of 300 ft. and trailing length of 137.5 ft.) on all approaches of the bridge.	05-99-223	\$55,000
06	Bladen	NC 242 1,000 feet north of SR 1116 (Horse shoe Road) and 1,000 feet south of SR 1116 near Elizabethtown.	Wedge and overlay through curve, 1,000 feet both directions from SR 1116.	06-07-211	\$171,000
06	Columbus	US 74 at SR 1562 (Wooten Road) near Chadbourn.	Close the median crossing on US 74 at SR 1562 to prevent full movement.	06-07-213	\$115,000
06	Cumberland	South Bound I-95 Bus/US 301 at NC 24/ 210 (Grove Street).	Extend right turn lane on SB I-95 Bus./US 301 by milling and resurfacing for approximately from bridge number 61 over Cross Creek to NC 24/ 210 (Grove Street).	06-07-210	\$156,500
06	Cumberland	NC 87 at SR 2238 (Sandhills Road) in Gray's Creek south of Fayetteville.	Modify the existing left turn lanes on NC 87 to better define the offset lefts and install a flashing yellow arrow indication on the north bound NC 87 left turn lane.	06-07-215	\$144,000

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06	Cumberland	US 401 Bypass (Skibo Road) at US 401 (Raeford Road) in Fayetteville.	Install steel guardrail along eastbound US 401 (Raeford Rd) at the tee of intersection with US 401 Bypass (Skibo Rd) to provide protection across a culvert.	06-07-216	\$12,500
06	Cumberland	NC 24 (Grove Street) at SR 1838 (Dunn Road).	Remove the existing five-section heads for NC 24 approaches, and replace with flashing yellow arrow signal heads.	06-07-217	\$23,500
06	Cumberland	NC 24 (Bragg Boulevard) at SR 1437 (Santa Fe Drive) in Fayetteville near the Fort Bragg Boundary.	Extend existing right turn lane by an additional 910 feet full and 150 feet taper.	06-07-218	\$158,000
06	Cumberland	SR 1408 (Bonanza Dr) at Glen Canyon/School Drive	Install signal with pedestrian indication.	06-07-220	\$95,500
06	Harnett	US 401, US 421, NC 20, NC 27 in the Town of Lillington on US 401 (Main Street) from 500' S from the intersection of US 401 and NC 210 to Harnett Street and US 421 (Front Street) from the intersection of US 401 (Main Street) and US 421 (Front Street) to SR 1257 (13th Street).	Install a closed loop signal system along US 401-421, NC 27-210 in the town limits of Lillington at the current signalized intersections.	06-07-208	\$51,000
06	Harnett	NC 87 at Cagle Dr./Food Lion Entrance/Linden Oak Subdivision Entrance near Spring Lake.	Install a signalized super street	06-07-219	\$250,000
07	Alamance	SR 1587 (Pagetown Road) and SR 1581 (Stoney Creek Church Road).	Install 2 concrete islands in order to double indicate stop signs on both legs of SR 1587 (Pagetown Road).	07-07-213	\$123,000
07	Guilford	SR 3041 (Clapp Farms Road) at SR 3045 (Mount Hope Church Road) near Greensboro.	Realign SR 3041 (Clapp Farms Road) to improve the intersection angle.	07-01-210	\$75,000
07	Guilford	SR 1005 (Alamance Church Road) at SR 3330 (Southeast School Road) near Greensboro.	Construct a left turn lane for westbound SR 1005 (Alamance Church Road) and revise the traffic signal to accommodate the subject turn lane.	07-03-201	\$150,000
07	Guilford	SR 3037 (Lee Street Ext.) and SR 3033/3036 (Sharpe Road) near Greensboro.	Construct left turn lanes on Lee Street Ext. and install a traffic signal.	07-04-213	\$225,000
07	Guilford	NC 68 and SR 2269. (Alcorn Road), in Oak Ridge	Construct turn lanes on Alcorn Rd. approaches and upgrade signal. The T intersection north of Alcorn, SR 2132, will be closed due to history of rearend collisions.	07-07-215	\$213,000
07	Guilford	SR 1129/SR 1424 at SR 4121 (Groomtown/Hilltop Roads at High Point Road)	Install two blank out signs that state LEFT TURN YIELD over the existing left turn lanes on SR 4121. The blank out signs will be activated only when the SR 4121 left turn signal is in the permitted phase.	07-07-216	\$4,884

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07	Orange	NC 86 at SR 1710 (Old NC 10).	Construct right turn lane on SR 1710 and install traffic signal.	07-05-246	\$165,000
07	Orange	SR 1713 (Mt. Herman Church Road) and SR 1710 (Old NC 10) near Hillsborough.	Improve sight distance on SR 1710 by lowering crest vertical on the westbound approach to the intersection	07-07-209	\$230,000
07	Rockingham	NC 770 and SR 1533 (Harrington Highway) and SR 1604 (Shady Grove Road) near Eden.	Install center islands with stop signs on the STOP sign approaches.	07-07-202	\$30,000
08	Chatham	NC 902 at SR 1006 (Siler City Glendown) at Harpers Crossroads.	Convert to a four way stop intersection.	08-07-205	\$18,000
08	Chatham	US 64 and SR 2229 (Treatment Plant Road)/SR 1363 (Pearlman Teague Road) in Siler City.	Install a concrete median island on US 64 from the US 64/ US 421 interchange to the existing island at the signalized intersection of US 64 and the Walmart Driveway. The island will only allow left turns from Westbound US 64 onto SR 2229 (Treatment Plant Rd). A bulb out will also be constructed at the intersection of US 64 and Walmart Dr. and also at US 64 and US 421 on ramp to accommodate U-turn movements.	08-07-206	\$30,000
08	Hoke	SR 1413 (Pittman Grove Church Road) and SR 1406 (Rockfish Rd) near Rockfish.	Modify the grade on the western leg of SR 1406 due to angle type pattern.	08-07-204	\$240,000
08	Lee	SR 1140 (McDougald Road) from Harnett County Line to SR 1144 (Greenwood Road) near Sanford.	Widen SR 1140 to provide 2 foot paved shoulders.	08-04-225	\$173,500
08	Lee	US 1 at SR 1731 (Quail Ridge Rd) near Sanford.	Install right turn lane on South Bound US 1 at SR 1731 (Quail Ridge Rd).	08-07-208	\$142,500
08	Montgomery	NC 24/27 at SR 1503 (Mill Street) near Biscoe.	Install a modified directional crossover on NC 24/27 at SR 1503. Channelization will prevent left turn movements from SR 1503 onto NC 24/27; however, left turns from NC 24/27 onto SR 1503 will be allowed. Project will include concrete island, widen intersection, resurface and striping.	08-07-207	\$125,000
08	Randolph	US 220 Business at SR 2114 (Providence Church Road) near Randleman.	Widen US 220 Business for a left turn, widen SR 2114 for a right turn lane and install a fully actuated traffic signal.	08-04-210	\$243,000
08	Randolph	SR 1595 (Surrett Drive) at SR 1748 (Trinity High School Drive).	Construct a Left Turn and Right Turn on SR 1595.	08-07-202	\$179,000
08	Randolph	US 311 (Main St) at both the North bound and South bound ramps of I-85 in Archdale.	Install two traffic signals, one at I-85 northbound ramp and one at I-85 southbound ramp.	08-07-209	\$50,000

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09	Davidson	NC 150 and SR 1453 (West Center Street) near Lexington.	Construct a left turn lane with 150 feet of storage on NC 150.	09-07-211	\$175,000
09	Davidson	I-85 Northbound & Southbound from where the existing rumble strips end just north of the Yadkin River Bridge to just north of US 29/52/70 for approximately 5.1 miles, near Lexington.	Install milled shoulder rumble strips on both inside and outside shoulders to fill in a gap on I-85 that does not currently have rumble strips.	09-07-212	\$150,000
09	Davidson	NC 68 (National Hwy) and SR 1772 (Hasty School Rd.) in Thomasville	Install a flashing yellow arrow on the northbound left turn protected-permitted phase	09-07-220	\$28,000
09	Davie	US 64 and SR 1604 (Aubry Merrell Rd)/SR 1808 (Joe Rd) near Mocksville	Install left turn lanes on US 64 on both approaches to the intersection with SR 1604/SR 1808	09-07-213	\$246,000
09	Forsyth	NC 66 (West Bodenhamer Street) and SR 2021 (Dobson Street).	Install a modern roundabout at the intersection.	09-04-202	\$250,000
09	Forsyth	NC 66 (Old Hollow Road) and SR 2211 (Baux Mountain Road) near Winston-Salem.	Install new traffic signal with wood poles.	09-05-204	\$36,000
09	Forsyth	SR 1171 (Williams Road) /SR 1001 (Shallowford Road) and Heritage Road (non-system) in Lewisville.	Installation of a modern roundabout.	09-06-203	\$250,000
09	Forsyth	Five full movement crossovers located on NC 150 (Peters Creek Parkway) between Link Road (non-system) and Academy Street (non-system) in Winston-Salem.	Physically restrict five full movement crossovers with raised concrete channelization so that only leftovers and U-turns (where currently permitted) are possible at these locations. Resurfacing will be required as part of the project on the innermost lane adjacent to the median for approximately 0.70 of a mile.	09-07-208	\$230,000
09	Rowan	SR 1221 (Old Beatty's Ford Road) and SR 1002 (Old Concord Road).	Improve sight distance at intersection for motorists stopped on SR 1221 looking north on SR 1002 by: 1. Raising the grade a maximum of 2' for a length of 250' in the dip north intersection. 2. Remove part of church bank & move horizontal alignment slightly to the west.	09-07-217	\$149,000
09	Rowan	SR 1221 (Old Beatty Ford Road) and SR 1006 (Organ Church Road), near Rockwell. SR 1221 had a Road Safety Review by Traffic Engineering Branch.	Realign SR 1221 to construct two offset T-type intersections. Currently a four-legged intersection.	09-07-218	\$123,000
09	Rowan	SR 1351 (Enochville Road) and SR 1124 (W. C Street), near Enochville	Construct a left turn lane on Enochville Road	09-07-219	\$250,000

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09	Stokes	NC 66 and SR 1970/SR 1132 (Mountain View Road) near King.	Install left turn lanes on all 4 legs of the intersection and upgrade signal to have standard signal phasing.	09-04-203	\$247,500
10	Anson	US 74 (Caswell St) and SR 1714 (Stanback Ferry Road).	Install directional crossover.	10-07-209	\$227,975
10	Mecklenburg	NC 51 (Matthews-Mint Hill Rd) and SR 3135 (Lebanon Road).	Install fully actuated signal.	10-07-204	\$53,000
10	Mecklenburg	NC 160 (Steele Creek Rd) and SR 1119 (Sledge Road).	Install turn lane and signal.	10-07-205	\$240,000
10	Mecklenburg	NC 24 (W.T. Harris Blvd) WB Ramp at SR 2939 (Old Concord Road).	Install 3-phase signal.	10-07-206	\$80,000
10	Mecklenburg	SR 3168 (Sam Newell Rd) and SR 3167 (Rice Road).	Install turn lanes and signal.	10-07-211	\$240,000
10	Mecklenburg	SR 2472 (Mallard Creek Church Road) and SR 2713 (David Taylor Drive).	Install directional crossover.	10-07-212	\$180,000
10	Mecklenburg	SR 2464 (Odell School Road) and SR 2467 (Mallard Creek Road).	Realignment of intersection and install left turn lane on Mallard Creek Road.	10-07-213	\$145,000
10	Stanly	NC 138 between SR 1956 (Old Aquadale Road) and Charlie's Store.	Cut down hill crest approx. 2' to improve sight distance.	10-07-214	\$250,000
10	Union	SR 1344 (Matthews-Weddington Road) and SR 1388 (Antioch Church Road).	Install 2 phase fully actuated traffic signal and construct left turn lane on Matthews-Weddington Road.	10-06-204	\$245,000
10	Union	SR 1367 (Unionville-Indian Trail Road) and SR 1518 (Faith Church Road).	Install turn lanes and 2-phase signal.	10-07-207	\$245,000
11	Caldwell	US 321 at NC 268/SR 1346.	Construct limited movement crossover and two downstream bulb-outs for u-turning traffic	11-07-205	\$225,000
11	Surry	NC 268 at the US 21 NB ramps.	Install traffic signal.	11-07-204	\$55,000
11	Watauga	US 421 at SR 1514 (Bamboo Rd.)	Revise signal phasing to provide flashing yellow arrow display for NB US 421.	11-07-208	\$10,000
12	Alexander	NC 127 from SR 1166 to SR 1167. (1.75 miles).	Install guardrail at several locations.	12-07-212	\$125,000
12	Catawba	US 70 at SR 1709(Rock Barn Rd.)/ SR 1713 (East 1st Street).	Revise signal # 12-0728 to provide flashing yellow arrow heads for WB US 70 and NB US 70.	12-07-211	\$25,000

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12	Gaston	NC 275 at SR 2003 (Spencer Mtn. Rd.)	Construct left turn lane for WB NC 275.	12-07-214	\$183,000
12	Iredell	US 21 at SR 1922 and SR 2171 (Janes Sowers Road).	Construct NB and SB left turn lanes on US 21 and install traffic signal.	12-07-202	\$240,000
12	Iredell	SR 1100 (Brawley School Road) at Rolling Hills Road.	Install a two phase traffic signal.	12-07-203	\$51,000
12	Iredell	US 21 at SR 1930 (Fort Dobbs Road).	Install a three-phase traffic signal.	12-07-204	\$51,000
12	Iredell	SR 1551 (Scotts Creek) @ SR 1645 (Old Wilkesboro Road).	Install flasher.	12-07-215	\$11,000
13	Buncombe	SR 1367 (Erwin Hills Road) at entrance to West Buncombe Elementary School near Asheville.	Install actuated traffic signal and coordinate with the signal at SR 1368 & SR 1367 (Signal Inv. # 13-0576).	13-05-205	\$50,000
13	Buncombe	US 25-70 at SR 1834 (Garrison Branch Road #2) near Weaverville.	Construct right turn lane on northbound US 25-70 at SR 1834.	13-06-210	\$85,000
13	Buncombe	US 19-23 at SR 1210/SR 1135 (Fairmont Rd.) near Asheville.	Install fully actuated flasher with two advance warning flashers.	13-07-211	\$70,000
13	Buncombe	US 25A (Sweeten Creek Road) at Wesley Drive/Givens Estate.	Construct left turn lane on US 25A.	13-07-215	\$240,000
13	Buncombe	US 25A (Sweeten Creek Road) at Park Avenue.	Construct left turn lane on US 25A.	13-07-216	\$240,000
13	Buncombe	US 25A (Sweeten Creek Road) at Ballantree Drive.	Construct left turn lane on US 25A.	13-07-217	\$240,000
13	Buncombe	US 25A (Sweeten Creek Road) at Hollybrook Drive.	Construct left turn lane on US 25A.	13-07-218	\$240,000
13	Buncombe	US 19-23 Business (Merrimon Ave) at SR 2094 (Stoney Knob Road).	Install an actuated traffic signal on wood poles.	13-07-219	\$80,000
13	McDowell	SR 1240 (Parker Padgett Rd.), 0.5 mi. east of SR 1234 near Old Fort.	Realign sharp curve.	13-07-209	\$95,000
13	McDowell	US 221 (Marion Bypass) from NC 226 to US 70 near Marion.	Install rumble strips on the median and outside paved shoulders.	13-07-212	\$25,000
14	Haywood	NC 110 at SR 1876 (Sonoma Road) near Canton.	Install left turn lane on northbound NC 110.	14-03-209	\$80,000
14	Haywood	NC 110 at SR 1867 (Coffee Branch Road) near Canton.	Install a left turn lane on southbound NC 110.	14-03-210	\$80,000

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14	Haywood	NC 110 at SR 1914 (Hill Top Road) near Canton.	Construct a left turn lane in the southbound direction of NC 110 at SR 1914.	14-03-219	\$50,000
14	Henderson	US 64 at SR 1726 (Pace Road) near Edneyville.	Construct a left turn lane on US 64 and install a traffic signal on wood poles.	14-06-201	\$95,000
14	Henderson	SR 1352 (Butler Bridge Road) between SR 1345 and SR 2270 in Mills River.	Realign sharp curve on SR 1352 just east of SR 2270. Length of project = +/- 0.20 mile.	14-06-214	\$245,000
14	Henderson	SR 1783 (Ridge Road) at SR 1730 (Owensby Road) near Hendersonville.	Realign intersection to improve sight distance.	14-07-210	\$25,000
14	Henderson	SR 1006 (Howard Gap Road) at SR 1513 (Nix Road).	Install an actuated traffic signal & add a left turn lane on SR 1006.	14-07-211	\$75,000
14	Henderson	US 25 at SR 1537 (Old Brickyard Road).	Install traffic signal with metal poles and mast arms. Integrate this signal into the existing closed loop system along US 25.	14-07-212	\$125,000
14	Macon	US 64/NC 28 at US 23-441 NB off-on ramp near Franklin.	Install actuated traffic signal with metal poles. Include a left turn phase.	14-04-201	\$125,000
14	Macon	NC 28 at Macon Plaza in Franklin.	Install an actuated traffic signal with metal poles and mast arms. Construct a right turn lane into Macon Plaza. Coordinate this signal with the signals at the US 441 ramps.	14-04-203	\$170,000

Total Number of Projects: 144 ***Total Cost of Projects:*** \$17,538,675

APPENDIX I

ROAD SAFETY REVIEW SITE SELECTION PROCESS

NETWORK SCREENING

The crash database was utilized to retrieve the crash records for all two-lane rural highways between 2002 and 2006. The count of KAB's (severe crashes) and total crashes was collected. The data was grouped by county and route. Also, the lengths of the routes were determined. Since, Road Safety Reviews (RSR's) require significant resources the following preliminary criteria was established:

1. Length: => 2 miles
2. AADT: => 200
3. KAB Count => 5

The sections with AADT's > 15000 were eliminated since typically these sections are in/near large municipalities or were listed in the TIP to be widened.

The **KAB %**, the number of KAB crashes divided by the total crashes, was calculated. The **KAB Density**, the number of KAB crashes per mile, was also calculated. Next, the **KAB Rating**, the product of the KAB % and KAB Density, was calculated to obtain a weighting factor. A **mileage adjustment factor** was derived based on the route's total mileage so that the identification list does not favor shorter routes. The calculation for the mileage adjustment factor is shown below:

$$\text{Mileage Adjustment Factor} = (\text{mileage})^{0.25}$$

The **adjusted KAB Rating** is the product of the KAB Rating and the mileage adjustment factor.

All 2-lane rural highways were given ranking points by the adjusted KAB Rating, by the KAB Density and by the **KAB Count**. If a section was not in the TOP 75, it was given 75 points for that ranking scale. The points from each of the three ranking scales were summed for each highway. The highways were ranked according to the combined points or **KAB Ranking** from lowest to highest points.

The KAB Ranking, Division Equity and Region/Division staff input will determine which highways will be studied for a Road Safety Review.

PRE-CONSULTATION WITH REGION/DIVISION STAFF

Before compiling a work plan for an RSR, the Traffic Safety Project Engineer will consult with field engineering staff to determine a corridor's project plans and recent project history. A determination will be made on how the projects will impact (or have impacted) crash patterns. If it is determined that recent project(s) have improved the traffic safety for the corridor of interest, discussions will be held to determine if the corridor should be excluded.

CRASH ANALYSIS

The above-described network screening methodology is not intended to eliminate the opportunity to select portions of a route. Prior to an RSR being scheduled, a detailed crash analysis will be performed. If the analysis indicates “trouble spots” with concentrations of severe crashes, the RSR will focus on these areas.

PRELIMINARY FIELD INVESTIGATION

Before compiling a work plan for an RSR, a preliminary field investigation will also be performed, if feasible, to assess whether a location is appropriate for a road safety review.